15 September 1964 · Two shillings and sixpence

55

Twice-monthly · 1st and 15th

Volume 130 Number 3257

MODEL ENGINEER

Incorporating Home Mechanics

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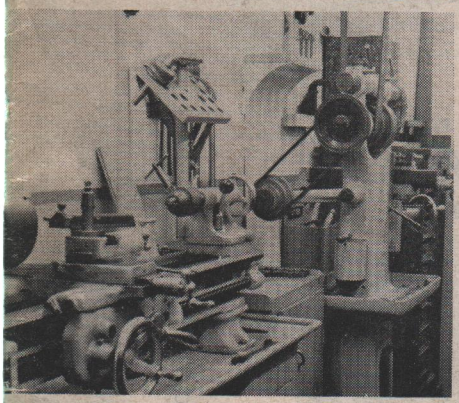

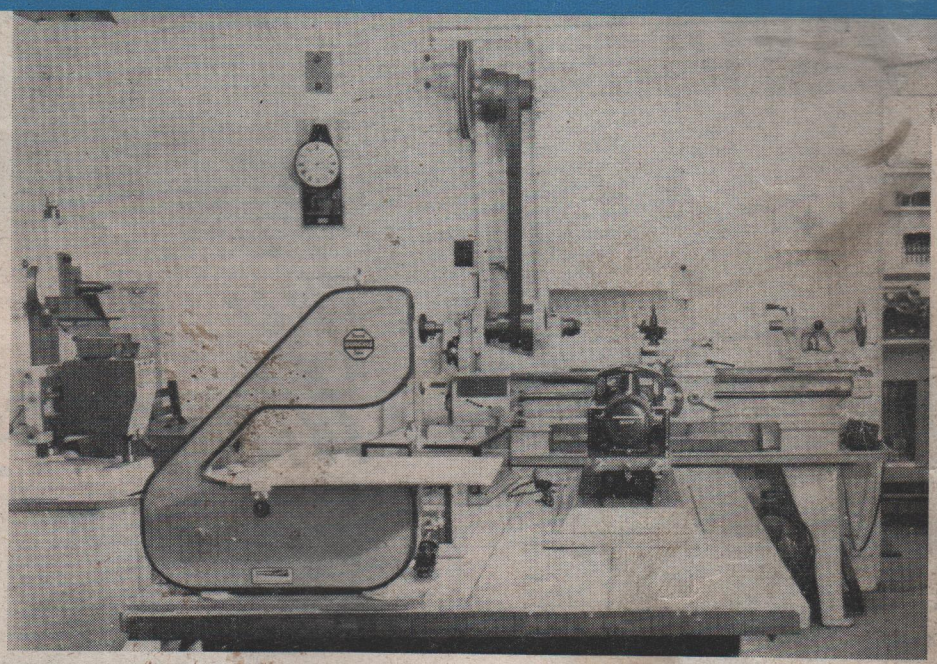

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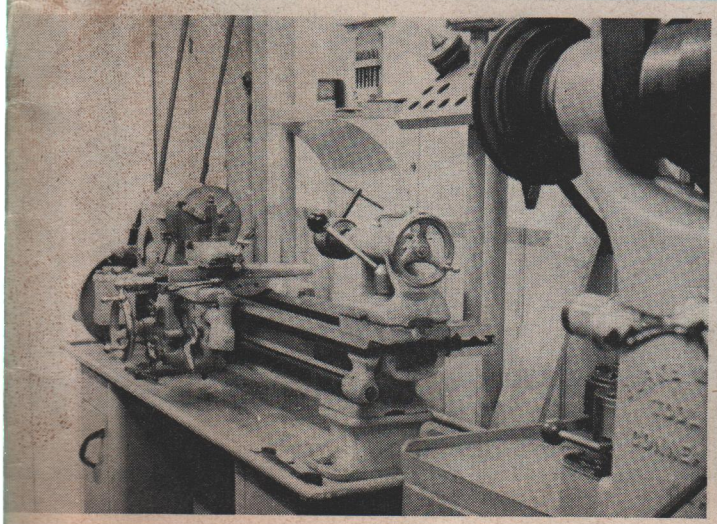

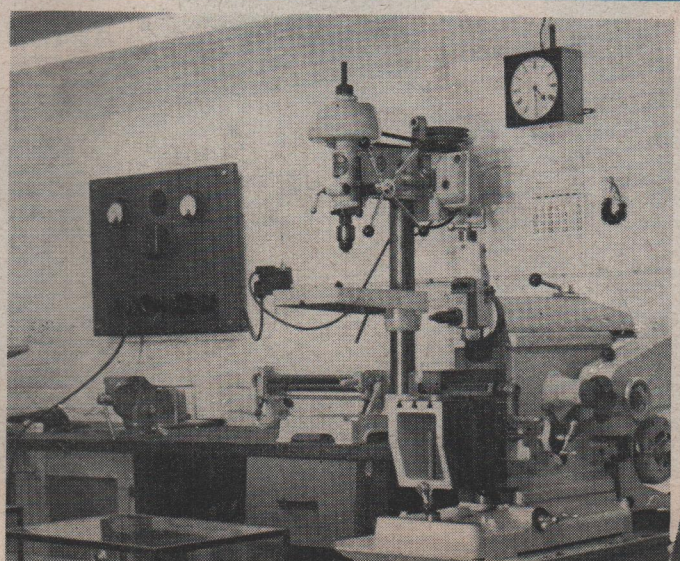

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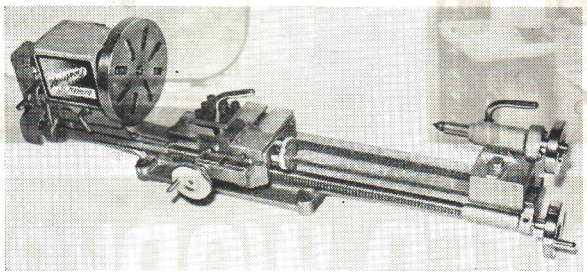

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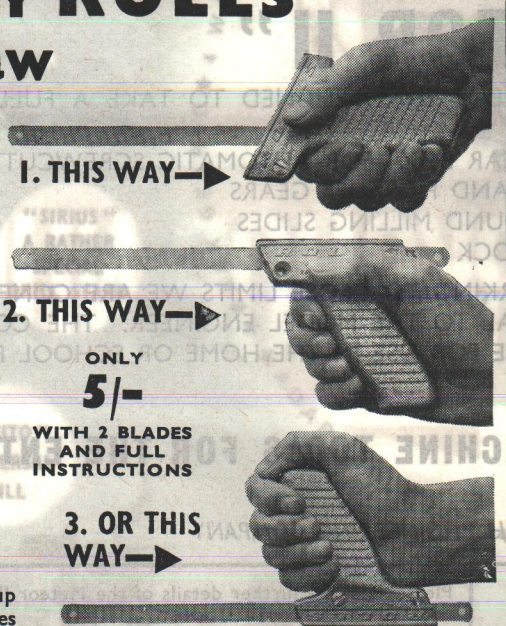

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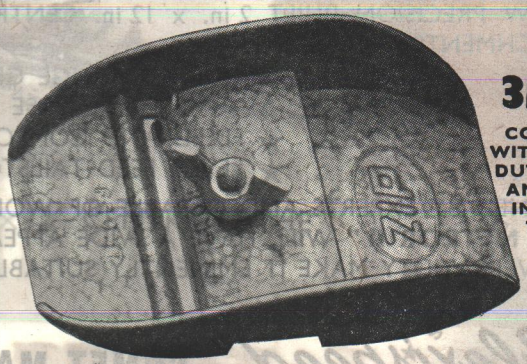

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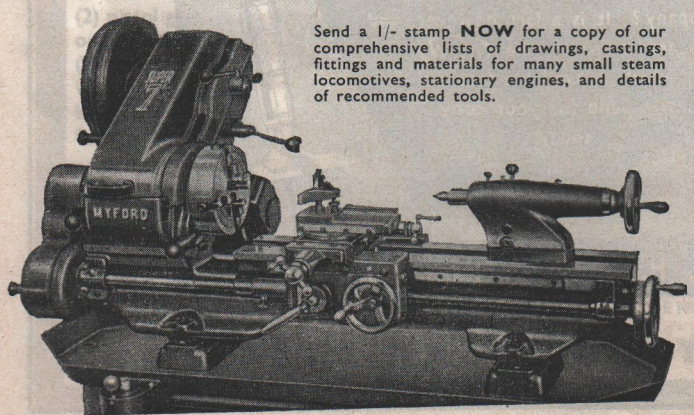

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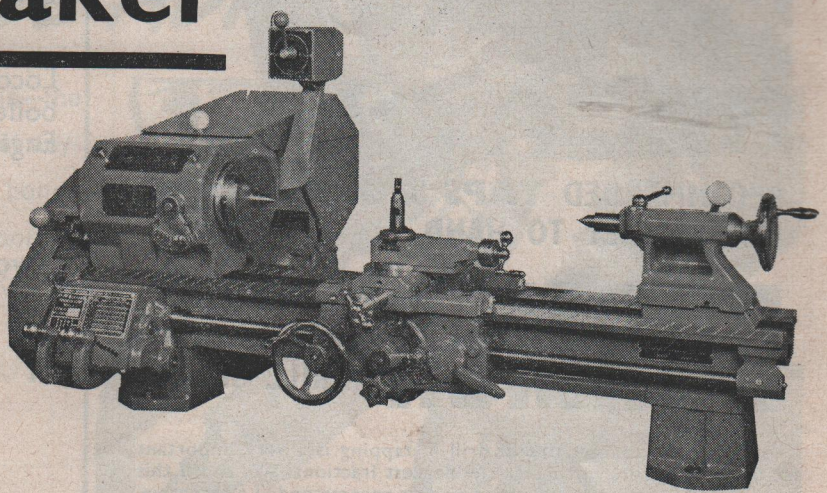

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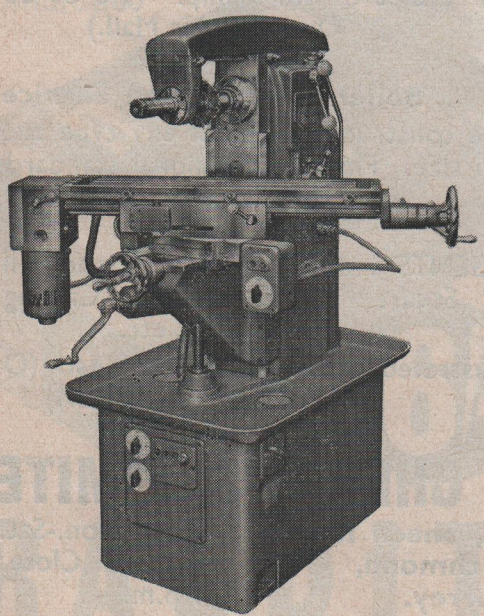

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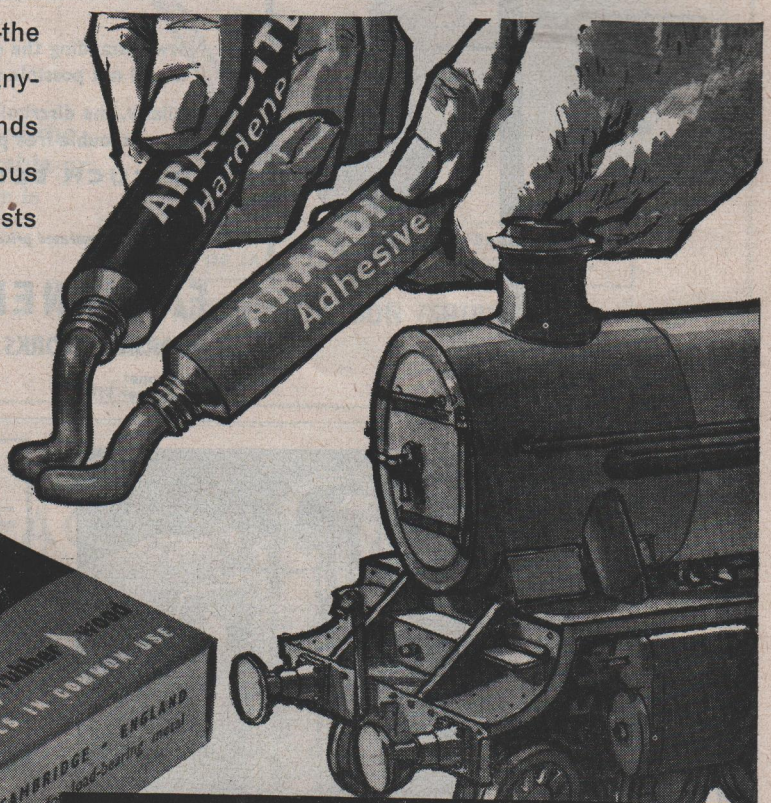

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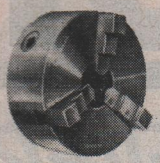
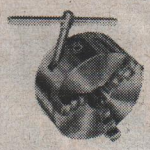
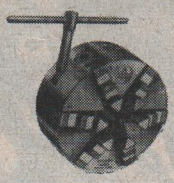


3 JAW GEARED SCROLL

4 JAW INDEPENDENT



3 JAW GRIPTRU



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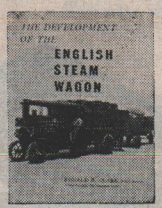

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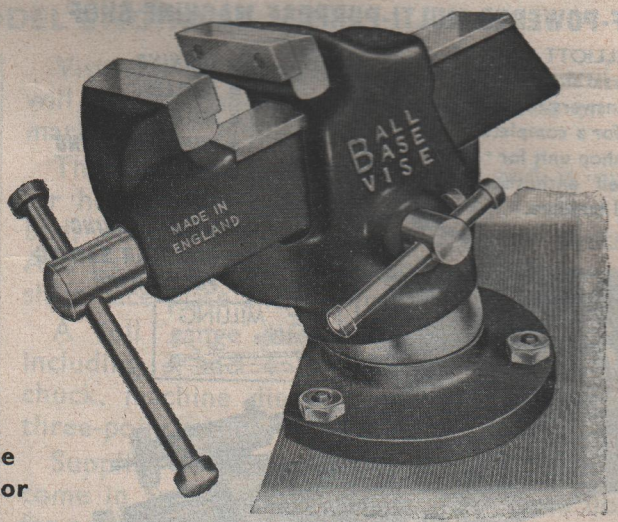

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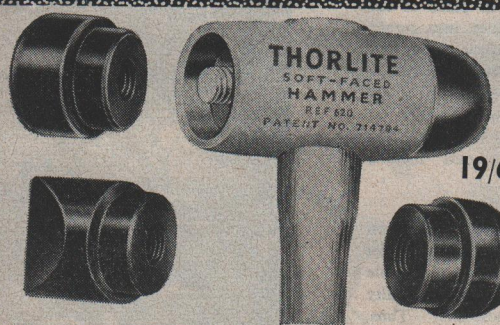

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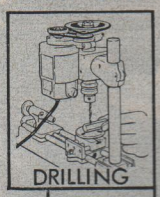

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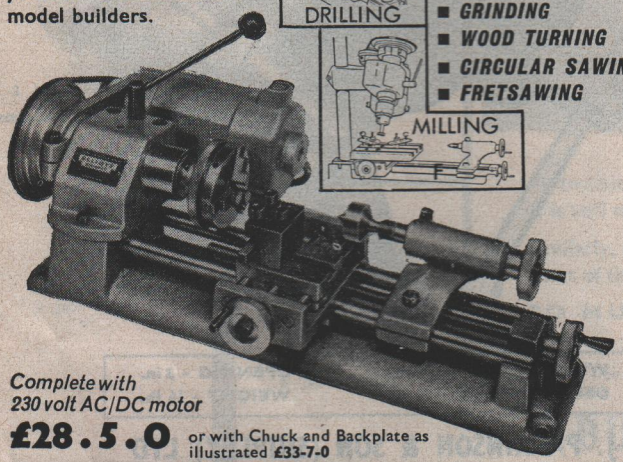

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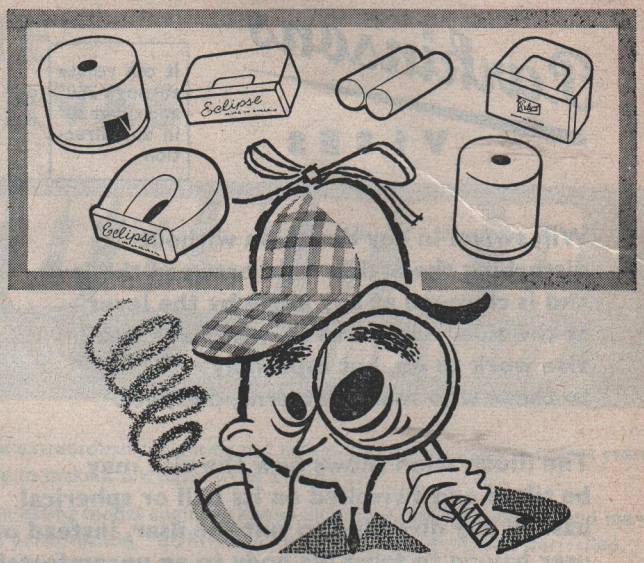

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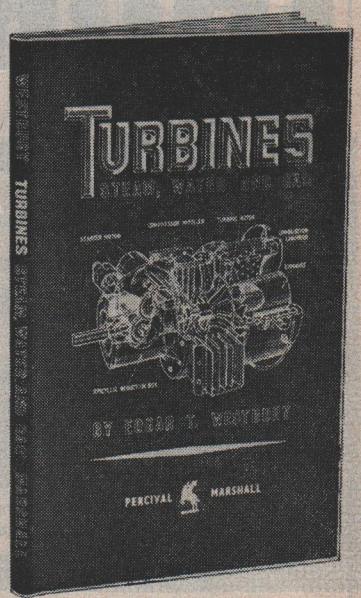

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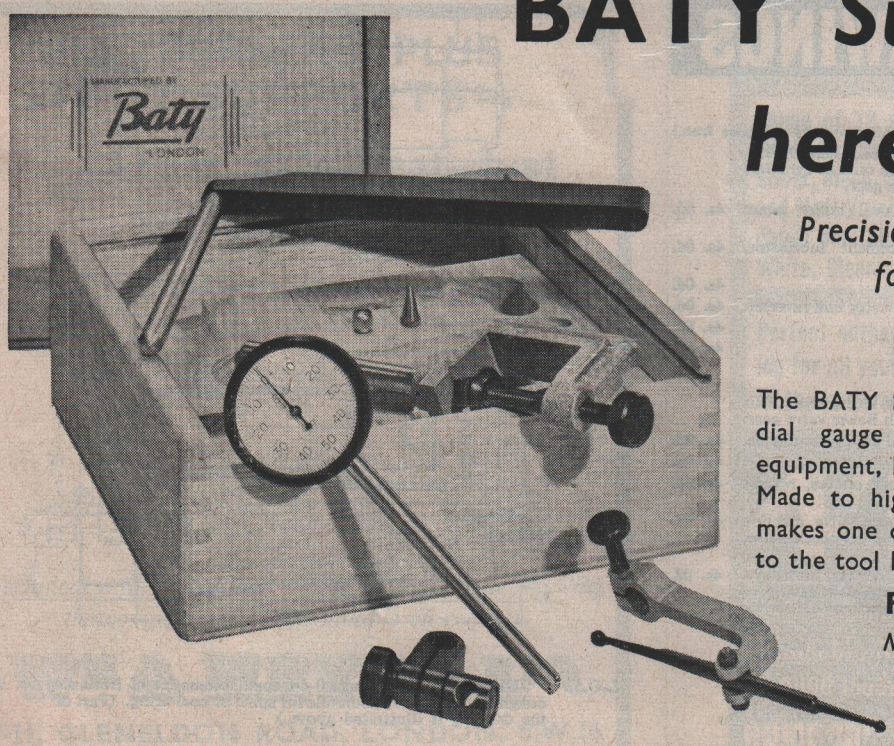

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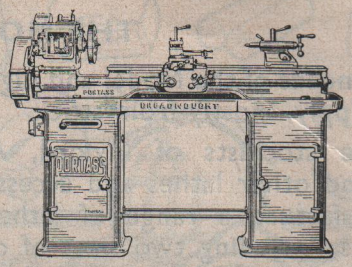

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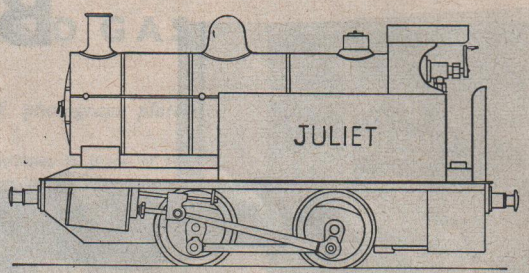

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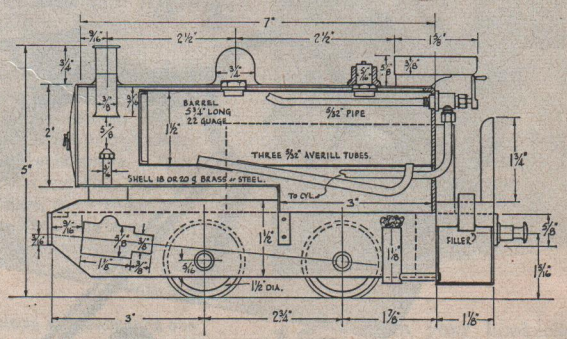

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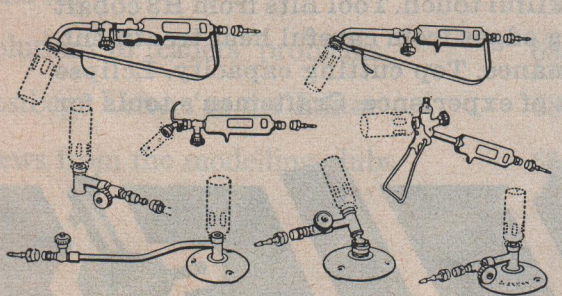

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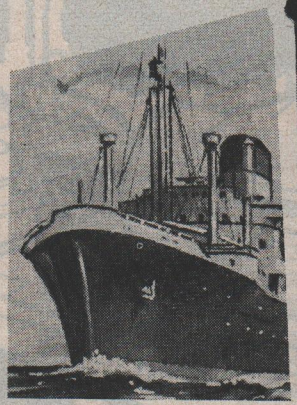

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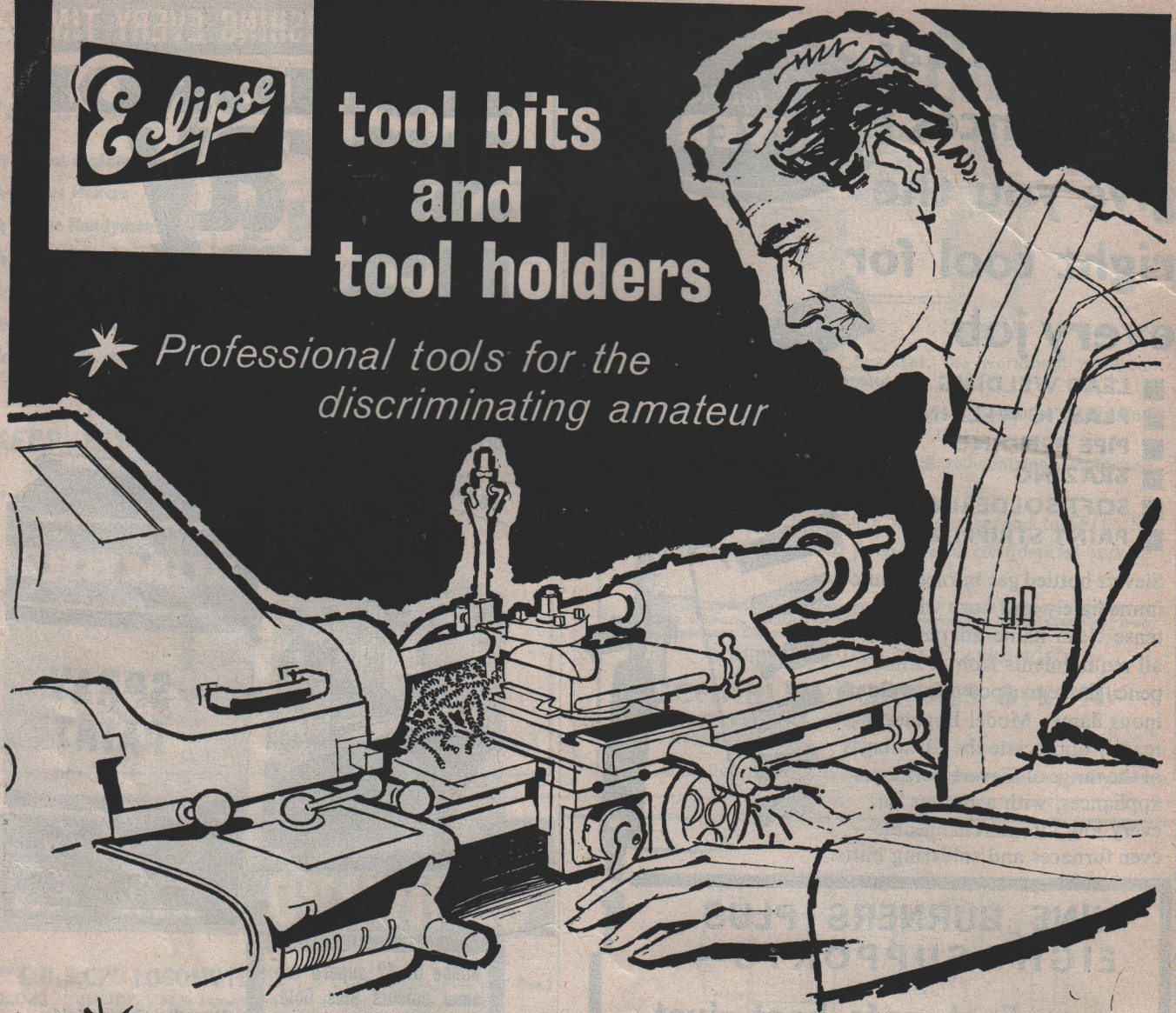

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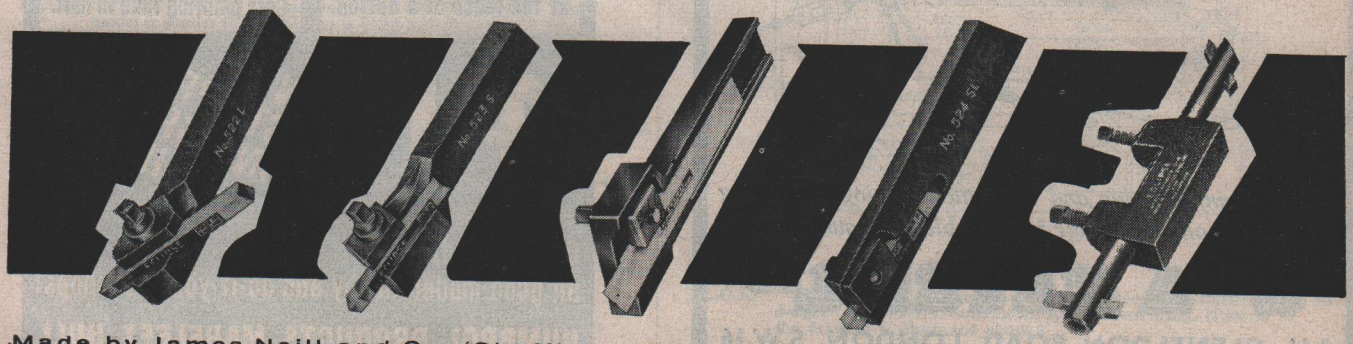

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MODEL ENGINEER

Incorporating Mechanics (Home Mechanics and English Mechanics) and Ships and Ship Models

19-20 Noel Street, London W1

15 Sept. 1964 Vol 130 No 3257

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Cover picture

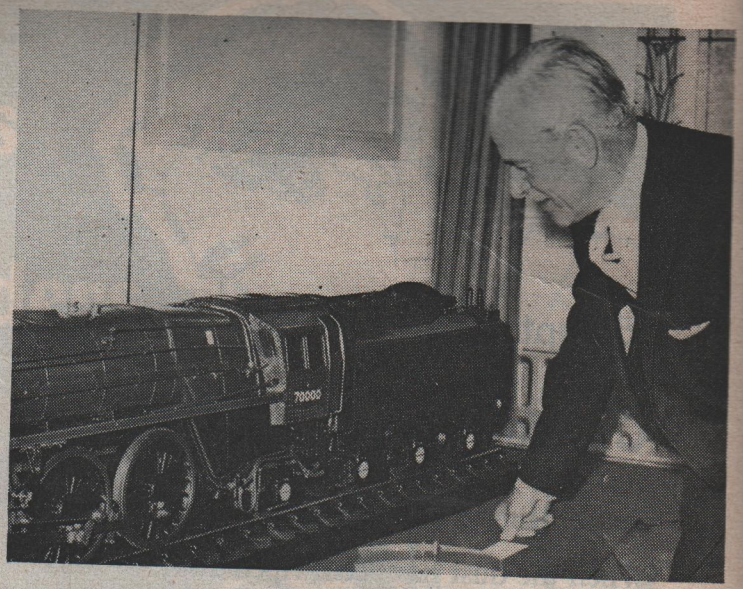
While the sun is still high in the heavens seems an odd time to talk about winter in the workshop. But the regular reader knows that at this time of year we put forward a few ideas that can be acted upon in time for the dark evenings when the enthusiast sets off in the direction of a cosy workshop

Oct. 1 issue

Those who could not attend the grand Model Engineer Exhibition will have a chance to read about it in the next issue. All the major classes and exhibits will be described by your favourite authors, some of whom were the judges of the sections

SMOKE RINGS

A commentary by VULCAN



Mr R. A. Riddles, having just opened the 1964 *Model Engineer Exhibition, makes a tour of inspection. He admires a model of the* BRITANNIA *he created*

Good time by all

DELIGHTFUL, wonderful, perfect ! It is perhaps a little invidious for those of us at Noel Street to praise the exhibition sponsored by ME. But nor is it any less embarrassing for us to quote the comments which came spontaneously from those who attended.

The embarrassment must, I fear, be accepted. Those three epithets—delightful, wonderful and perfect—were used again and again. Some of those present had never been to an ME Exhibition before and had no conception of the high standard to be expected; and some, too, were only vaguely acquainted with models before they arrived. But we received the same tributes from the initiated. More than one respected member of the Old Brigade declared that he could not remember a better show.

"You must hold it here again next year," said a great many. Others, pleased though they were with the Cora Hotel, asked for a still larger hall. We met no one who was not highly delighted with the Cora, with its charming decor, with its luxurious amenities, and with the sincere friendliness of the staff, most of them Irish. The most telling comment was made by a young man who had decided during the Exhibition to spend his honeymoon there: we assume that he had already found someone to spend it with him.

In comfort

It was certainly the most comfortable exhibition which ME had ever held. If you wanted tea you had only to walk a few yards and be served with it in the very agreeable lounge. A certain well-known model engineer who would not walk an inch to see a teapot was equally satisfied after taking a few eager strides in another direction.

You could sit down and rest; you could go into a quiet place and talk to an old friend from afar. It was a holiday merely to be there.

The weather could not have been better. If the hall was sometimes more than warm, the streets outside were sweltering. Some visitors may have walked in to escape the sun—but most of them had obviously set out with the intention of paying the show a visit. The great attraction for the general public was the *Perseverence* ship model built by Arthur Bartlett, the blind and deaf Islington basket-maker.

For this notably successful exhibition we must thank the three ME men who carried the weight of organisation: the Editor (Leslie B. Howard), the Assistant Editor and American Editor (Joseph Martin) and the Technical Editor (Martin Evans). Only two people know quite how hard Mr Howard toiled and how well he deserved the enthusiastic applause he received. And all the time the normal work at Noel Street somehow had to continue. If anything displeases you in this issue, please try to forgive us: we were running a national exhibition as well.

Scottish collector

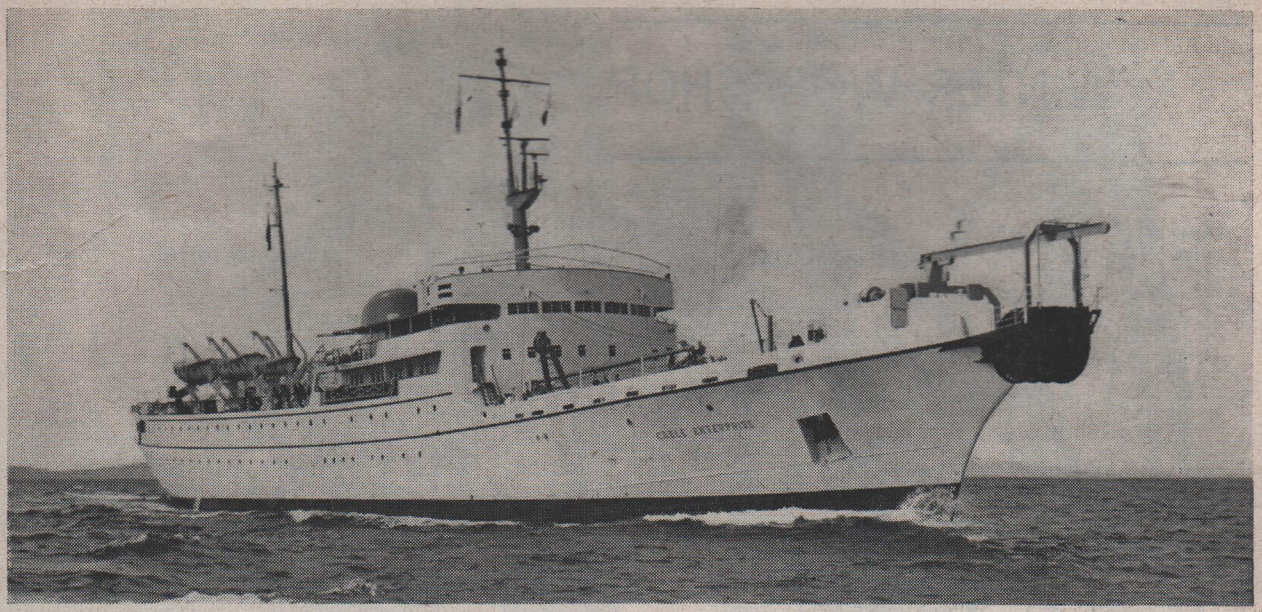
WHILE we still have men like Ian Fraser of Angus, live-steam interests will never die. Readers will recall how a few years ago this determined Scot finally overcame opposition to his plan to build a magnificent "garage" for his traction engine.

Some time later he added a contractor's "Pug" to his steam stable. Now he has surpassed all his previous efforts with the purchase of *Morayshire*, the only surviving D49 4-4-0.

In a letter telling me of the excitement of hauling *Morayshire* from the Dawsholm motive depot to Inverurie works he describes the twenty minute halt at his home town, Arbroath, where the Provost turned out to greet him.

A pipe-major of the British Legion was also present with appropriate music—such Scottish airs as "The Cock o' the North," "The Back o' Bennachie" (which was where they were heading), and "Will Ye No Come Back Again ?" floated down the track as a great crowd thronged the platform to honour the occasion.

Mr Fraser says that the locomotive will be put into first class (but not working) order at Inverurie works at his expense, and it will then be offered on permanent loan to a museum of national importance.



Above: CABLE ENTERPRISE *has attractions for ship modellers. Below: Ian Fraser's latest acquisition,* MORAYSHIRE, *is almost hidden by the locomotive* GORDON HIGHLANDER *that towed it to Inverurie*

For the ship modeller?

FROM the picture which Philip Kershaw sent me, the *Cable Enterprise,* latest unit in the Cable and Wireless fleet, seems an excellent subject for a model. The hull is modern, yet graceful, and the superstructure is pleasant but with enough detail to offer a challenge. The beam and drum at the bows would add a distinctive touch to a scale version.

The diamond rail alongside the deck cabins is a bit unusual. It might create difficulties to anyone working in too many feet to the inch.

The *Cable Enterprise* was in the Pool of London recently for a courtesy visit before leaving on her maiden voyage to Singapore where she will assist in the SEACOM operation—the laying of the South-east Asia link of the Commonwealth cable.

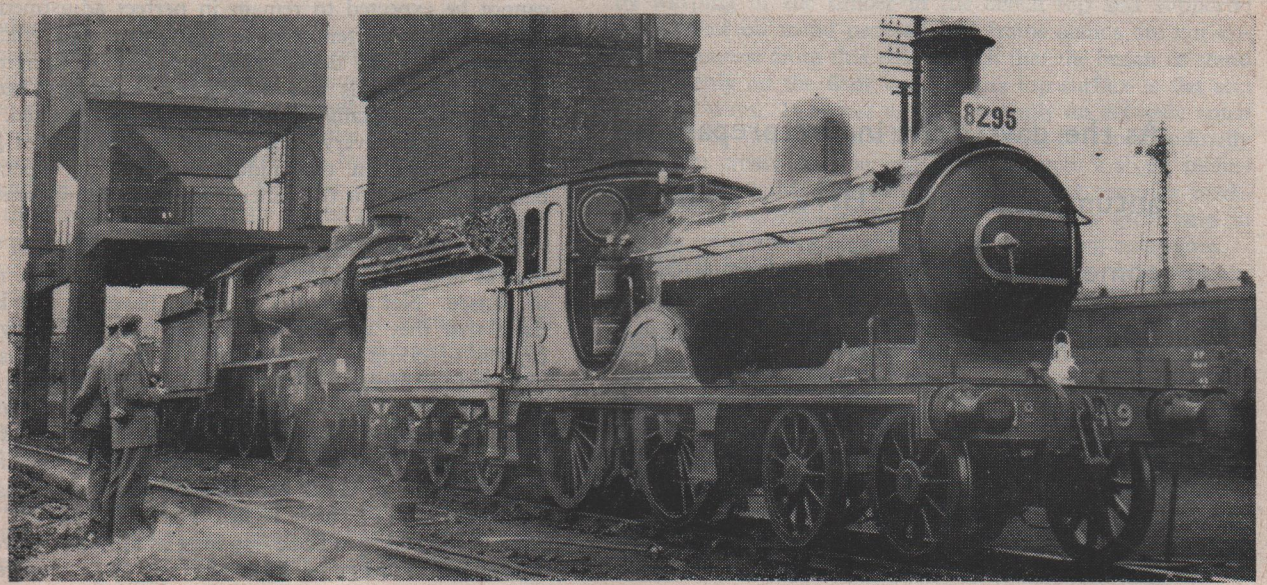
She was built at Birkenhead by Cammell Laird and launched last February. She has a length of 330 ft, a moulded breadth of 49 ft, and loaded she draws 19 ft of water. Three diesel engines provide power through generators for the two propulsion motors driving twin screws. English Electric had the contract for her main machinery. Over the measured mile she has exceeded 16 knots.

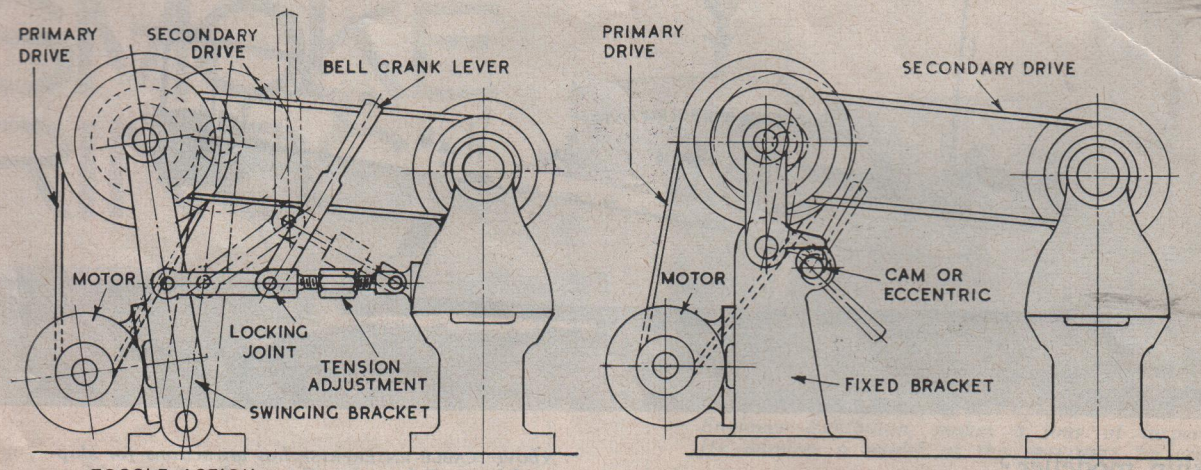
Big attraction

YOU will remember the model dynamometer "car" that Mr J. Hobson of Harrow built and described in MODEL ENGINEER?

It has proved so successful and aroused so much interest that he is constantly being asked to take it to other clubs. So that it may cope with higher speeds and accept larger rolls of paper for even more accurate recording, he is rebuilding some sections of it.

This is the kind of experiment that we are all delighted to hear about at Noel Street.





DIAGRAMS SHOWING PRINCIPLES OF COUNTERSHAFT GEAR

When the summer dust has all been wiped away

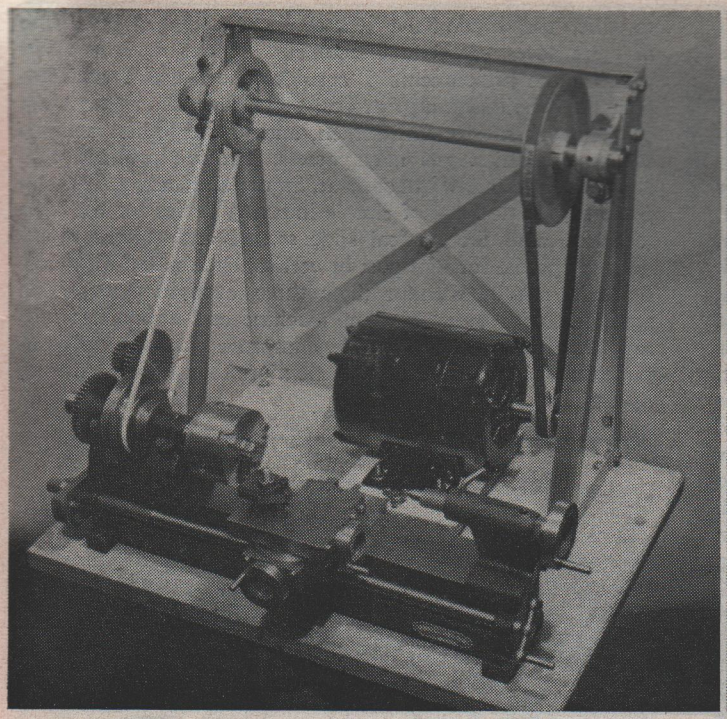
As the days draw in, we prepare for autumn cleaning. Here a modeller comes in from the sunshine to look at some of the preliminary tasks—the overhauls and improvements which will brighten the programme ahead

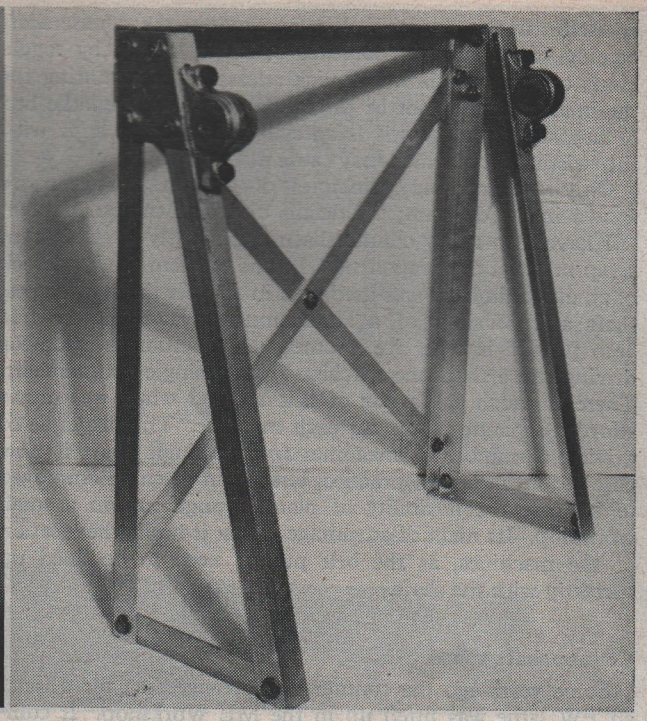
THE summer of 1964 may well be notable for a resurgence of outdoor activities among model engineers; locomotive track meetings, power boat regattas, traction engine rallies and special excursions have been well attended and highly successful. But now that the hours of daylight are rapidly decreasing, the time has come for us to consider a return to the workshop, which may have been idle for several weeks except for an occasional overhauling or repair job. There are many model engineers who plan to launch new projects in the months ahead, and have already begun a kind of autumnal " spring cleaning " in preparation for them.

Cleaning off the dust and cobwebs—but not rust, we hope —from the workshop equipment, is a necessary preliminary, but we need more than a mere tidying-up. Machine tools deserve an overhaul at least once a year; their working parts cannot be expected to remain in perfect adjustment indefinitely, and it is often possible to improve their efficiency by attention to small details. Minor items of equipment, including hand tools and appliances, workshop furnishings and electrical installations, should not be neglected. Now is the time to put everything in good order. Do not postpone this task until in the middle of some big operation an emergency arises or the deficiencies of the equipment become painfully apparent.

The lathe is quite rightly regarded as the major machine tool in any mechanical workshop, but it is often neglected or abused. Not all model engineers have the best lathes, or those that they would like to have, but nearly any lathe is capable of doing good work if it is properly adjusted, and will last a lifetime with due care and attention. Some workers whom I know seem afraid to do anything to a lathe beyond the usual minor adjustments. They are scared of making matters worse instead of better. But you need only common sense to check for any faults that may exist and to take steps to put them right. The principle of " let well alone " is a very good one—so long as all really is well.

Mandrel bearings of lathes do not often require adjust-





ment if they are kept well lubricated, but it is just as well to check them for slackness, either in the journals or the end thrust. If there is any suspicion of roughness in running, the mandrel should be withdrawn for inspection. In the lack of closures over oil holes in bearings, grit or swarf may get in and cause scoring of the journals. The surfaces should then be rubbed down with a fine oilstone to remove, or at least reduce, the score-marks, and the insides of the bearings should be scraped smooth.

Ball thrust races sometimes become pitted or scuffed, and the only remedy is to renew them. Before you refit and adjust the bearings you should wash them out, not forgetting the oil holes, and thoroughly wipe them clean. It is worth while to fit closed oil feeders of some kind if this has not already been done.

Static balancing

The mandrels of some older lathes, with heavy cast iron cone pulleys, were not perfectly balanced, and now that lathes are run faster, this matter may call for attention. We can easily test static balance by rolling the mandrel assembly on knife-edges, and we can correct it by filing or drilling away metal on the heavy side. While it is more difficult to balance the assembly dynamically if the counter forces are in different lateral planes, static balancing is usually sufficient except for extremely high speeds, above the normal range of metal turning lathes.

Slide adjustments should be checked at various points between the limits of their travel. The greatest wear inevitably takes place in the region where the slide is most used. With the saddle, this area is near the headstock end of the bed. Serious wear can be corrected only by the re-scraping or grinding of the bed, a task for those who are specially skilled. A lathe which is well made and fitted in the first place will work for a long time before needing such treatment. Generally the only attention required on the slides is the removal of roughness or high spots on the working surfaces, and the adjustment of gibs to take up slackness without their being made too stiff to operate. Endwise adjustment of feed screw bearings will help to eliminate backlash and erratic movement of slides.

The lathe apron gear, including the lead screw clasp nut and its operating cam, should also be examined. Often the slides in which the half-nuts operate will be found badly out of adjustment, and threads clogged solid with a mixture of grease and metal dust. Burrs and roughness of the threads need to be smoothed off unless they are so severely worn that the half nuts require renewal. Before you re-assemble the lathe apron, consider how the lead screw and clasp nut can be protected in the future against the entry of foreign matter and kept well lubricated.

Bench-mounted lathes are sometimes twisted out of truth by warping of the timber in the bench top and supports; even lathes on metal pedestal and frame stands are not entirely immune from this risk. Check that the bench or stand rests evenly on the floor and that its top surface is flat and level all ways. It is just as well to apply an accurate spirit level to the surface of the lathe bed itself, first longitudinally and then crosswise, near each end. Though a slight inclination of the lathe does not necessarily affect accurate working, a truly horizontal datum line is often a great help in setting up work for boring or other machining operations.

The lathe driving gear deserves its share of attention; sometimes it is sadly neglected, and not as well adjusted as it might be. Advice is often sought on ways of fitting a power drive on the smaller lathes when it is not provided by the makers. Treadle drive appears to be almost obsolete, and it is often left to the lathe user to devise what he can.

Countershaft units for bench mounting are obtainable and can be adapted to most small lathes, or they may be built up from standard components such as pulleys, plummer blocks and mounting brackets. Where V-belt drives are employed, a rigidly mounted countershaft may make belt shifting difficult. For short drives, some form of tension release

is useful, if not essential. You can mount the countershaft bearings on a swinging bracket which is located by toggle levers or cams to allow of quick release. The mounting for the bracket should not be directly attached to the lathe bed or headstock, unless this is specially designed to cope with the twisting force which may cause distortion.

Only the working principles of countershaft gear are shown in the diagram; the details of design can be adapted.

I have seen many countershafts ingeniously devised from scrap material or components. In one of them the headstock of an old plain lathe was used, and in another the side frames, shaft and bearings of a superannuated lawn mower had been pressed into service. Sometimes provision is made for driving more than one machine from a single countershaft. There is much in favour of this method when we cannot afford a separate motor for each machine. The principle of driving a number of machines from a single shaft is now obsolete in industrial practice, but it can often be employed to increase the flexibility of plant arrangement in a small workshop. Its main disadvantage is that it limits the location of the machines, as the belt pulleys need to be lined up correctly with the shaft.

Countershaft speed

Some years ago the countershaft arrangement for driving an EW lathe was fitted up in the ME Workshop. It comprises two triangulated end frames of angle section material, strengthened by gussets, a cross tie and cross braces of flat strip. Standard pulleys for the primary drive, and plummer block bearings with sintered bushes, were employed. The need for providing belt tension adjustment did not arise, as the secondary drive was by round section plastic belting, which gave satisfactory results.

The cone pulley on the countershaft should always be the same in step dimensions as the one on the lathe mandrel (but arranged in reverse order, of course) unless there are special reasons for variation. Countershaft speed should be regulated by the relative sizes of the pulleys on this shaft and the motors. With the normal fractional h.p. motor, which runs at 1,425-50 r.p.m., a ratio of about 3 to 1, as obtained by pulley of 7½ in. and 2½ in. diameter, will give a countershaft speed a little under 500 r.p.m.—satisfactory for general work. Lathes can be run at much higher speed than this if they are used only for small bar work in mild steel, brass and other free-machining metals, but for heavier work, especially castings, slower speeds are essential.

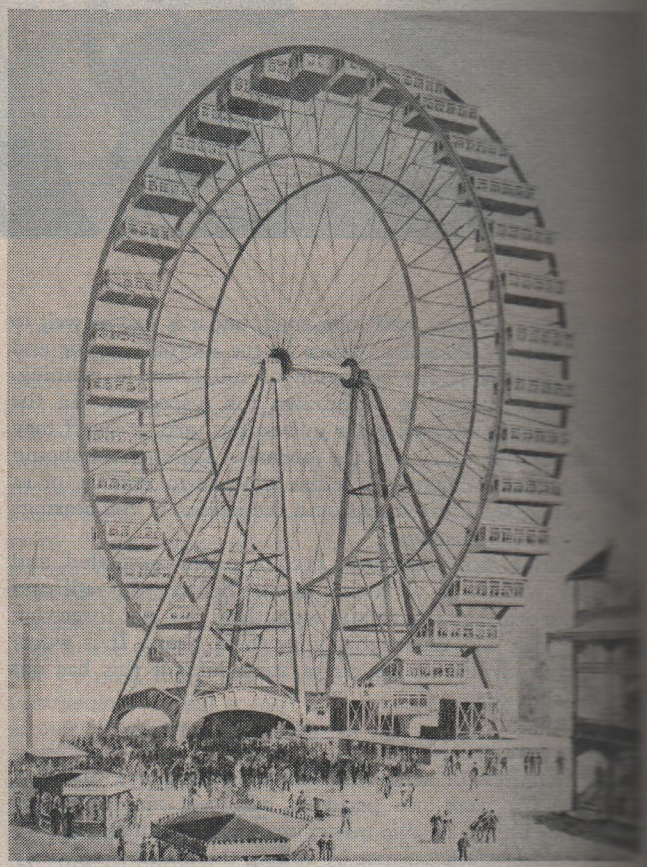
It is worth while to provide a two-step primary drive, giving countershaft speeds of about 500 and 1,000 r.p.m., to increase the range. The high speeds are particularly useful for fine drilling.

At the other end of the range, back-gearing gives a much better combination of low speed and high torque than any form of *direct* belt drive. For lathes up to about 3 in. centres, a motor of ⅛ h.p. will provide enough power for most of the work, but a ¼ h.p. motor costs only a little more and will provide an ample margin.

While all this is very elementary, it answers questions which are constantly being asked, and not always by mere novices. It is surprising how many users fail to get the best efficiency from lathes and other items of equipment through the lack of guidance on installing and driving them. Experience teaches that good results are obtained, not necessarily by the most elaborate or expensive equipment, but by the best use of the limited means available.

Opinions vary widely among model engineers on the extent to which the scope of the lathe can be extended by the fitting of extra accessories and attachments. I was recently asked which lathe attachments I consider most useful and important. Obviously, a great deal must depend on the nature of the work mostly undertaken, and on the other machine equipment which you may possess. From experience with almost every kind of attachment, fixture and gadget, I should place first some form of simple indexing device for the lathe mandrel, with the vertical slide second and a light rotary milling spindle for tool post or vertical slide mounting third. I would not be without these three, even in a workshop equipped with every kind of machine and appliance; they save time and trouble, and they improve accuracy on components which involve just a little more than normal turning operations.

T. E. Barton.



STOP talking about the Pillar of Light at the New York World's Fair ! It may be wonderful in its way, but you cannot have a thrilling ride on it as you could have had on the Ferris Wheel at the Columbian Exposition long ago. "This great engineering feat," said a magazine of the time, "is to the Columbian Exposition what the Eiffel Tower was to the Paris Exposition." We are told that the mechanical difficulties were far worse than any met with in the building of the tower. "It is a noble monument to the skill of American engineers . . . The highest point of the wheel is 264 feet above the level of the ground, and the total weight of steel in motion is 1,800 tons." As for your Pillar of Light —why, every night no fewer than 3,000 incandescent electric lights illuminated the wheel !—Michael Carroll sent ME the picture.

MATERIALS FOR A MODEL HULL

Have you thought of using brass? Do you know that aluminium is not so difficult to solder as many of us suppose? Oliver Smith offers a handy guide before winter begins

ATTENDING model power boat regattas during the summer season gives us an opportunity to see new ideas in design, details and materials. During the long winter evenings we can put some of the ideas into practice.

But none of us can remember everything. What *was* the name of that adhesive? What solder did that fellow say he used? We feel like kicking ourselves for our failure to make a note at the time.

I am trying to help now with some general guidance in the construction of hulls. It is here in particular that many are glad of advice—especially, of course, the beginners.

Little need be said of the bread-and-butter method, a favourite which has proved itself. While the basic principle remains the same, this form of construction has been advanced in recent years by the continued development of glues and synthetic adhesives. Names like Cascomite, Aerolite, Stretobend and Evostick are now very familiar to modellers. The preparations are completely reliable provided that the makers' instructions are adhered to correctly. Unlike the stuff from the old glue-pot, they can be applied without fuss or mess. Some of them, too, take only a short time to set.

Often a beginner who has used the bread-and-butter method for his first power boat likes to try making a model hull for his next model. The interest taken in my *Moorcock* and *Cranborne* models shows that the modeller is not only concerned about the authenticity of his deck and detail work but is also eager to build his hull on lines resembling those of full-size practice.

Metal hulls shaped from tinplate around a wooden former are not difficult to build and have been popular for many years. The material used is often salvaged from cocoa or coffee tins and similar containers. When these are cut up into strips the plating is done for the cost of the solder and flux only.

ME is often asked to recommend a particular solder or flux for this kind of work. Many seem to think that there is some secret in the process. Provided that the elementary rules of soldering are observed, no hidden magic is required. Lead-tin solders, and the proprietry fluxes sold by tool shops, are quite satisfactory. All the builder needs to remember is that as the tin content in the tin-lead ratio increases so does the price. The advantages are a lower melting temperature and easier work. We can choose from a wide range of flux preparations, such as Fluxite, Bakers, Cannings and Tinflo in liquid form, or the resin-based paste.

Acid-based fluxes are corrosive and the work should be thoroughly washed after it has been completed. Corrosion of the tin plate hull also has to be guarded against, even when the boat has been built. In the course of a day's sailing, pond water will find its way into the hull, and unless action is taken immediately to dry it out the old enemy will not be slow in taking advantage.

Many power boat enthusiasts, rightly preferring prevention to cure, coat the inside of the hull with some form of protective barrier before any machinery or equipment is installed. Often the stuff is their own pet solution, based mainly on what is obtainable locally. Some use a mixture of red lead, following the practice with full-size vessels, and others con-

tent themselves with plain undercoats. The method is effective, sometimes at the expense of the appearance of the interior.

The main disadvantage of these mixtures is that they tend to chip or crack if they are knocked. Trouble can arise as any liquid, particularly i.c. engine fuel, penetrates beneath the surface. Fortunately we can now get preparations which completely solve this problem. The Plus-Gas Company offers its Formula E, and Allweather Paints Ltd have their Pitan Corroless. Both products are excellent metal primers. Once the surface has been prepared, the normal procedure can be followed with a paint of your choice.

Used in Belgium

Another solution is to build the hull from a material which is not vulnerable to these conditions—for example, aluminium. When brass is mentioned, eyebrows are raised because of the cost, but if all the facts are considered you will find that brass is no more expensive than any of the other suitable materials. Some may think it too heavy, forgetting that a tin plate model will have to be ballasted for the intended displacement.

Those who prefer a light weight hull or need one for a particular type of model, may well consider aluminium. Our friends in Belgium are using it to make a yacht hull for beginners, but I have yet to see it used on any large scale in England. The reason probably lies in the old belief that it is not the easiest of metals for the amateur to join. I am not refering to the use of screws or rivets. These, of course, are no problem to fit, but they have disadvantages when smooth flush joins are called for in the shaping of a hull.

The mere thought of soldering aluminium leads many to assume that this is a process quite beyond their capabilities, perhaps because they confuse it with aluminium welding. But soldering aluminium is not so difficult as might be

imagined. Thanks to people like Industrial (Metallurgical) Services of Waltham Cross, Hertforshire, it lies well within the scope of the home workshop. This company supplies a range of solders and fluxes to meet all requirements, and is glad to provide information. For the benefit of the model engineer who would like to experiment, there are special trial packs of solders and fluxes.

A material which is gaining in popularity with model boat builders is fibre glass. The great value of this material is that it combines strength with a low weight ratio. If care is taken in shaping the moulds, the external surface of the finished hull will not require any further attention except for painting. There is no rust problem.

Those who are interested in this form of construction can take advantage of the progress made in recent years with Polyester Resins. One leading manufacturer, Scott Bader and Co. Ltd, supplies an excellent handbook outlining all the applications, complete with technical data. ▣

Promise of a new lathe

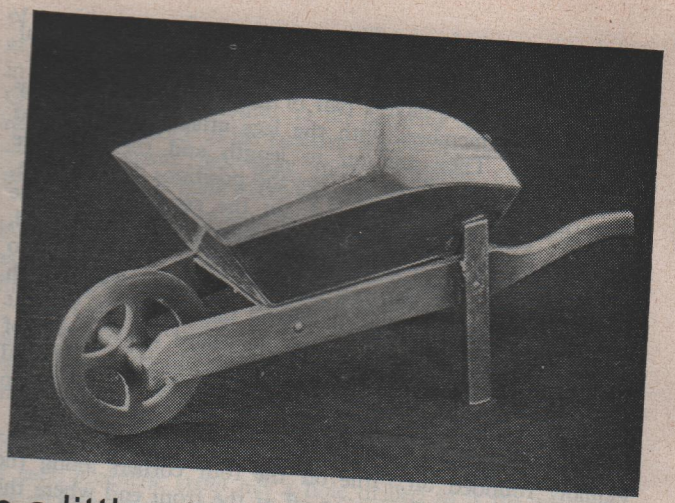
FLEXISPEED, well known in model engineering, has recently joined the Associated British Engineering Group.

This development offers opportunities of expansion and one of the consequences is a new range of machine tools at prices to suit the average home mechanic. Among these new products is a 2 in. × 12 in. centre lathe which it is hoped will be in production within the next few weeks. It has been designed to take a range of attachments including a quick-change gearbox for automatic screwcutting; a tumbler reverse and pick-off gears; fixed and compound milling slides; and a lever-feed tailstock.

The new lathe, to be called the Meteor II, is designed to work to close limits and should make a wide appeal to the model engineer. Flexispeed has promised MODEL ENGINEER the opportunity to review one of these lathes as soon as they come off the production line.

FOR THE SCHOOLS

Continued from September 1



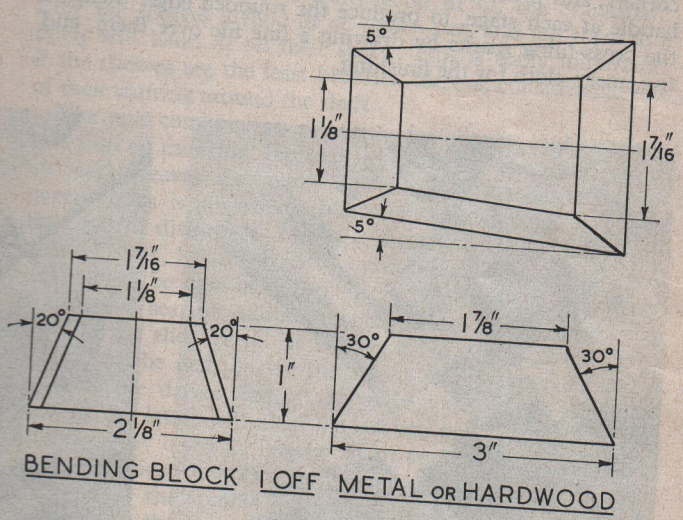
Neat work with a bending block

How the go-ahead pupil can make a little wheelbarrow of brass

By Edgar T. Westbury

To cut out metal to an external shape we can best use a piercing saw or metal fretsaw. While heavy bench shears can be employed on metal of this thickness, they are liable to cause distortion. Keep as close to the lines as possible, but slightly on the outside, so that the edges may be trimmed with a file where necessary. The cut-outs at the corners must be as accurate as you can make them, and bevelled with a three-cornered file so that, when the metal is bent, they will form a close joint.

A bending block, or former, made of metal or hardwood, produces a neat and accurate hopper with the least difficulty. It is made to the shape and dimensions shown, to form a mould of the inside of the finished work. Clean bends at the corners are also made easier if the floor lines are heavily scored on the inside surface with a woodworker's scriber or similar tool.



BENDING BLOCK 1 OFF METAL OR HARDWOOD

Before using the bending block, you should start the side bends, *but not complete them,* by clamping the sheet metal in the vice, with the floor line towards you, exactly level with the jaw surface. You may use a soft-faced hammer to bend the metal, working along the edge a little at a time. A better method is to lay a flat piece of wood against the metal and hammer on it. Our aim is to produce a clean and distinct angle, exactly on the marked floor line, but not to the final shape at this stage.

When one side has been bent, you may find that the vice jaws are too deep for the sheet to be properly positioned the other way up. You may then use a piece of rectangular metal bar as packing between the inside of the sheet and the front jaw *1*. Take care to keep it true with the floor line and the jaw surface. The bending is then carried out as before.

The bending block is placed against the inside surface of the sheet, with its front and back edges true with the floor lines. Block and sheet together are then clamped in the vice *2*, and the front and back of the hopper are bent into contact with the block by the method which I have explained. The bending of all the sides may then be completed, so that they fold down into close contact with front and back at all four corners *3*. If a final adjustment of the angles is needed, gentle hammering will provide a good fit at all the joints.

In all these operations you must take great care not to scar and bruise the metal. The serrated jaws of an ordinary bench vice will make ugly marks on the surface unless they have fibre or soft metal facings. Hard-faced hammers should not be employed for bending. Use the hammer as little as possible; excessive hammering hardens and stretches the metal, making it more difficult for us to produce surfaces free from distortion and blemishes.

You can strengthen the corner joints by soldering them with a copper bit (soldering iron) large enough to cope with the loss of heat in contact with metal. Another, and perhaps easier method is to coat the inside of each joint with solder paint (a paste compound of powdered solder and flux) and heat the work over a bunsen burner until the solder melts. It will then flow into the joint, and you can help it by scratching the metal with a pointed wire or broken hack-saw blade. Aim at getting the solder *into* the joint, not building up a seam on the surface. In all soldering operations, the elementary rules are to keep the metal clean and free from grease, and to use a suitable flux.

Then the two countersunk holes for attaching the hopper to the frame are drilled. Visible scratches, bruises or blemishes should be removed with medium emery-cloth—a better

finish can be obtained with finer grades—and then with metal polish.

For the frame we have a pair of shafts joined together by the two cross members with the legs attached to them at right angles. They are cut to length and the ends are squared off. Mark them out for the positions of the holes, measuring from the front end, on the centre line of the material. After one shaft has been marked out and drilled, it may be laid against the other and used as a jig. The two pieces may then be clamped together, with screws through the holes to keep them in the correct position when you file the front end at the angle shown and shape the contours of the handles at the other end. A large second-cut half-round file may be used to form the hollow curves to an even sweep and the flat side of the file for the rest of the contour.

The shafts may now be separated and the handles individually rounded off. File off the four corners along the length of each handle, easing off at the front end where the handle joins the leg. Then file away the eight subsidiary corners, and proceed in this way, along the full length of the handle at each stage, to produce the rounded edge. Remove the cross-filing marks by drawing a fine file over them, and use emery-cloth for the finishing.

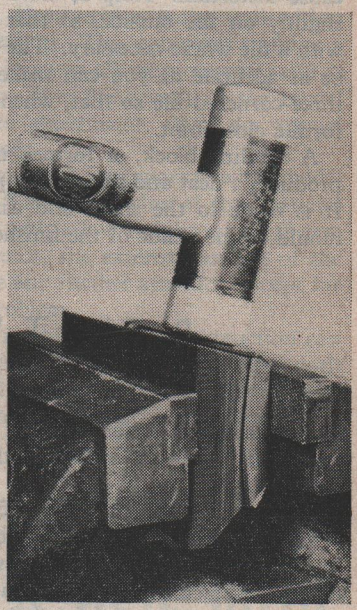
After cutting to length and drilling and tapping the hole, clamp the two legs together for rounding the bottom ends slightly. The angle at the top end should not be filed to the finished size until the barrow is ready for assembly. You must make the legs fit snugly against the sides of the hopper. In attaching each leg to the shafts, file a shallow groove across the shaft to form a seating for the leg and prevent it from turning out of position. Another way is for you to solder the leg to the shaft, by coating the contact surfaces with solder paint, clamping them together, and heating them over a bunsen burner. This should not be done until the barrow frame is ready for the hopper.

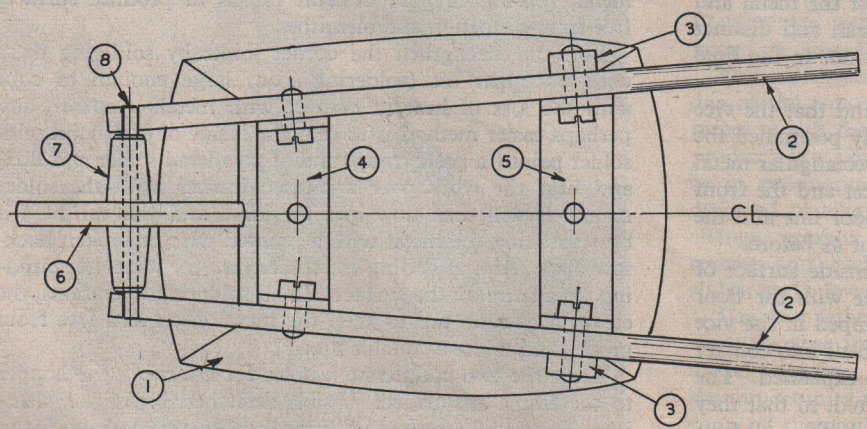
To be concluded

Left: Making the first bend. Note packing pieces

Centre: Folding the back and front of hopper

Right: Finishing touches with soft-faced hammer





UNDERSIDE PLAN

Check your marking-out carefully with the drawing before you work on the material

Revised Stephenson gear for the *Maid of Kent*

K. N. Harris modifies the valve motion on the LBSC locomotive

LBSC's DESIGN for the *Maid of Kent* locomotive is by no means ideal for the application of Stephenson's valve motion. The space between the cylinders is much constricted, having the centre line of the valve spindles on the same vertical centre line as the piston rods creating a considerable off-set in the rocking arm.

A pin length of even the acceptable minimum length requires us to offset the centre line of the link from the centre line of the eccentrics. But the forward eccentric has only a slight off-set, the backward eccentric taking up the remainder, and for an express engine this is acceptable. Bearing in mind these difficult conditions, my revised gear may, I think, be regarded as a satisfactory compromise.

The gear will give an excellent steam distribution in either direction; its essential proportions, ratio of eccentric travel to eccentric rod centres, and to centres of eccentric rod pins on the curved link, are pretty well identical with those used by G. J. Churchward on the GWR in the gear which he developed in the first decade of the century. As his system stood unaltered until Swindon ceased to make steam locomotives, we may reasonably assume that it would be difficult to improve on its proportions. The lifting gear, too, follows Churchward's principles, in itself a vital matter, for a badly designed suspension can ruin the functioning of the best link-motion.

Wearing surfaces are generous. By the use of suitable materials and the inclusion of case-hardened joint pins, and case-hardened eyes for them to work in, the gear should have a long and almost wear-free life.

With a lap equal to port length (measured of course along the axis of the cylinder) a travel in full gear equal to four times the lap, and a line-on-line exhaust cavity in the valve, cut-off in full gear will be as near as matters to 75 per cent, while the ports will be fully open to exhaust right up to mid-gear.

The valve setting should be arranged to give a *negative* lead of as nearly as possible 0.012 in. (twelve thou). With a gear of Churchward's proportions, the lead of the valve increases rapidly as it is linked up, and unless negative lead is incorporated in full gear the lead will be excessive and the cut-offs short.

Suppose for a moment that this gear were set with a lead of *positive* 0.012 in. in full gear. We should have over $\frac{1}{32}$ in. at 25 per cent cut-off, in fact the equivalent of about $\frac{7}{16}$ in. in full size, which by any standard is quite excessive. The GW gear was set around $\frac{1}{16}$ in. negative lead in full gear, resulting in about $\frac{3}{32}$ in. positive lead at 25 per cent cut-off —and so again this gear merely follows Churchward's principles which have stood up to 60 years' practical working.

The gear embodies launch-type links suspended about their horizontal centre line. Bearing surfaces throughout are made as substantial as possible, the four eccentrices taking up the full space between the inside face of the inside crank web.

This precludes the fitting of an eccentric-driven feed pump, but if a mechanically driven pump is required we can easily arrange a long stroke pump driven from one of the crossheads. Such a pump is detailed separately.

Allen setscrews No 5 BA are used to lock the eccentric sheaves in position and the lower portion of the back half of each eccentric strap has a hole drilled in it for an Allen key so that we can adjust the angular setting of the eccentrics without having to dismantle the straps. The centre sheaves must have their bores a really good fit on the crankshaft. Bore the sheaves a thou or so *under-size*, and lap them to a fairly stiff hand fit on their shaft. This is really important; if the sheaves are the least bit slack there is considerable risk of their shifting around the shaft.

The best combination of metals for sheaves and straps is cast iron on cast iron, but cast iron straps or gunmetal straps on steel sheaves are quite satisfactory. Case-hardening of curved links is always somewhat chancey as there is a distinct risk of distortion. I suggest that the links be made from ground stock, left in its natural condition, and that only the link blocks be case-hardened. For the valve drive we have a gunmetal seat of substantial proportions working between lugs on the slide valve. If we use a No 2 BA thread (31.4 threads to the inch) in the nut and a 40 t.p.i. thread for the clevis at the driven end of the valve spindle, one complete turn of the latter will alter the relative proportions of valve and clevis by 0.007 in. (eleven thou) and a quarter turn will give just under 0.002 in. (two thou). It is understood, of course, that the spindle is revolved while the clevis remains in position, the locknuts being temporarily slackened.

Owing to the very exiguous space into which the gear must be put, really accurate and careful workmanship is needed, with a strict adherence to dimensions all round. Given this, and a meticulous avoidance of any slackness in joint pins, the gear will provide a first-class steam distribution.

I strongly recommend mild steel for all joint pins. Silver steel is not reliable under constantly reversed stresses.

The valve setting would probably best be carried out with the link in mid-gear and the valve giving equal leads of about 15 thou (.015 in.). It is obviously much simpler to measure a positive lead than a negative one. The theoretical eccentric setting is 62 deg. behind the crank for forward gear, and the same ahead of the crank for back gear. A rocking lever of the first order reverses the normal setting of the eccentrics for direct drive.

For direct drive with outside cylinders the eccentric setting would be 118 deg. ahead of the crank for forward gear and 118 deg. behind the crank for backward gear.

I give these figures as a matter of interest, but in practice we have to set eccentrics by sighting the valves. We can adjust the eccentrics without having to unclip their straps, and we can see exactly what is the effect of any alteration.

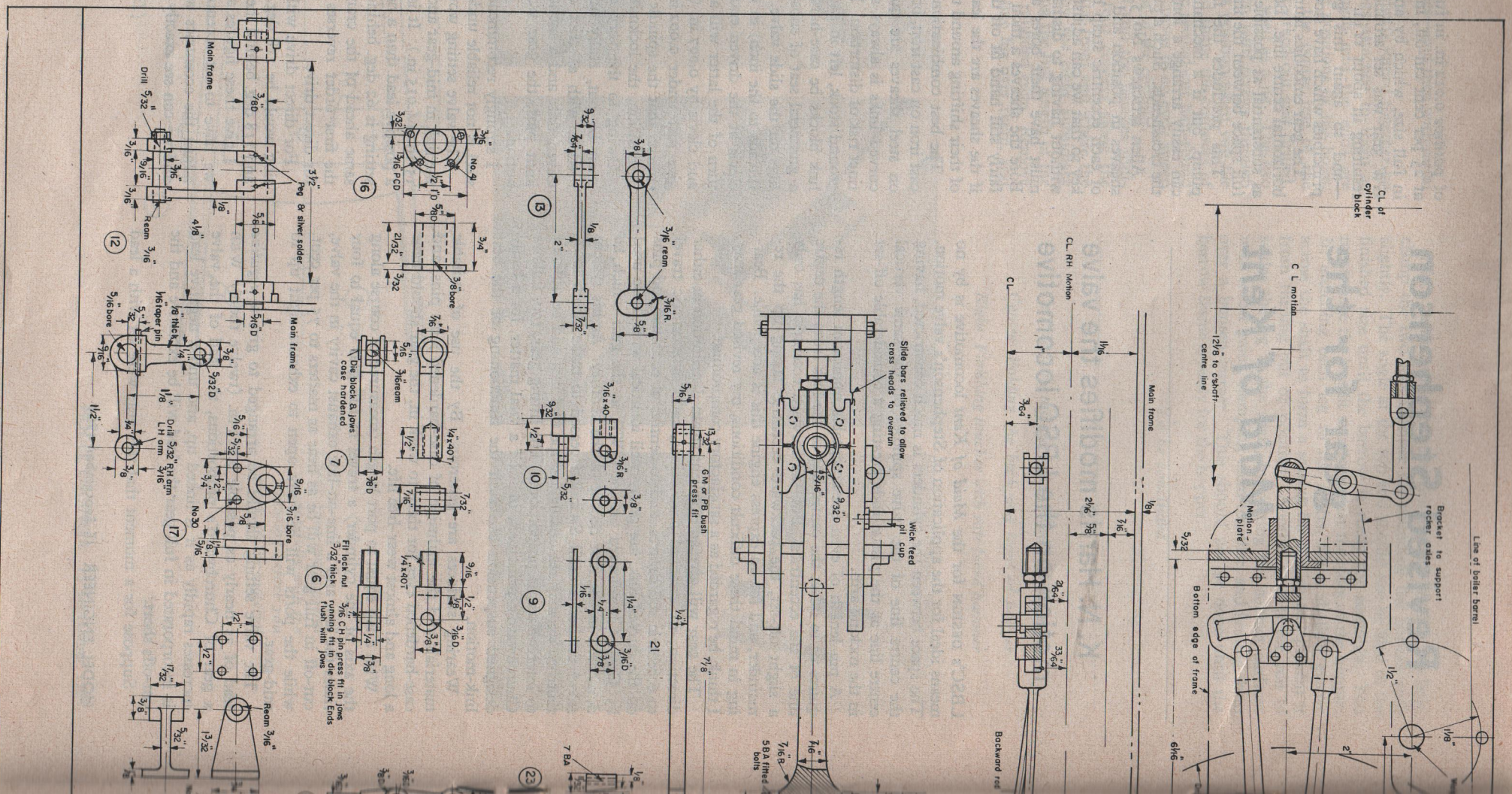
(Drawing overleaf)

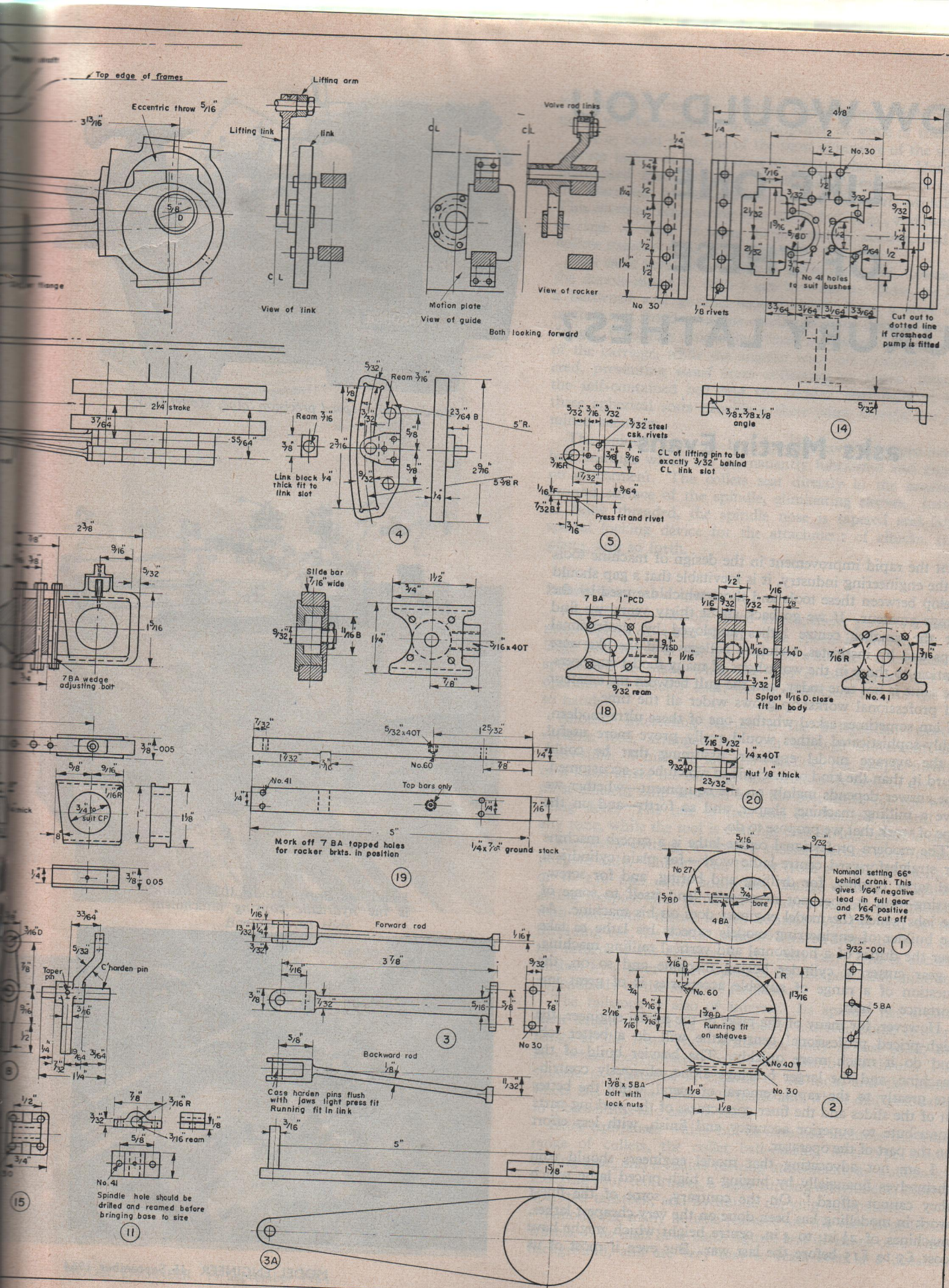
SCHEDULE OF PARTS

No on drawing	No required	Material
1 Eccentric sheaves	4	CI or MS
2 Eccentric straps	4	CI or GM
3 Eccentric rods	4	MS
3a Eccentric rods jig	1	MS
4 Link and link block ...	2 each	Ground stock
5 Link hanger bracket ...	2	MS
6 Link block fork	2	MS
7 Intermediate guide & pin	2	MS
8 Rocker arm assembly ...	2	MS
9 Valve spindle links ...	2	MS
10 Valve spindle crosshead	2	MS
11 Rocker spindle support	2	GM
12 Weigh shaft assembly ...	1 set	MS
13 Lifting links	2	MS
14 Motion plate	1	MS
15 Rocker support bracket	1	GM or MS
16 Intermediate guide bush	2	GM or CI
17 Weigh shaft bracket ...	2	MS
18 Crosshead assembly ...	2	MS
19 Slide bars	4	Ground stock
20 Gudgeon pin	2	MS
21 Connecting rod assembly	2	MS & GM
22 Big-end brasses	2 pairs	GM
23 Adjusting wedge	2	MS

Parts affected on other drawings:

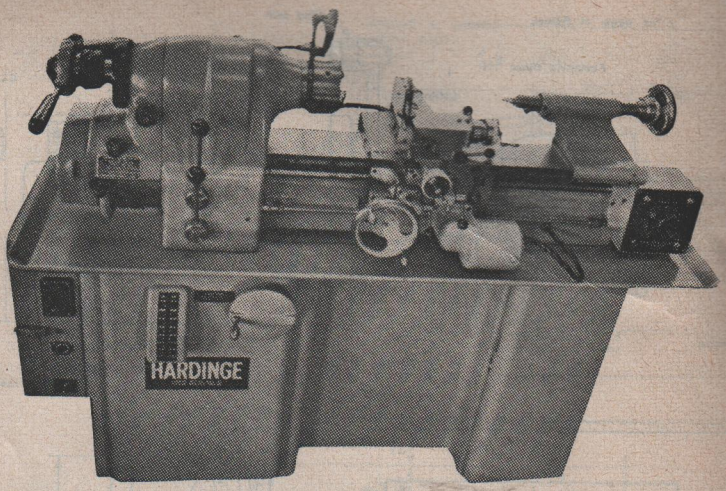
Cylinder ports	Re-dimension
Slide valve and driving nut	New
Valve spindle	New
Piston rod	Provide threaded end for crosshead
Reversing lever	Re-position connection to reach rod
Reach rod	Longer
Eccentric-driven pump ...	Out
Crosshead pump	Substituted



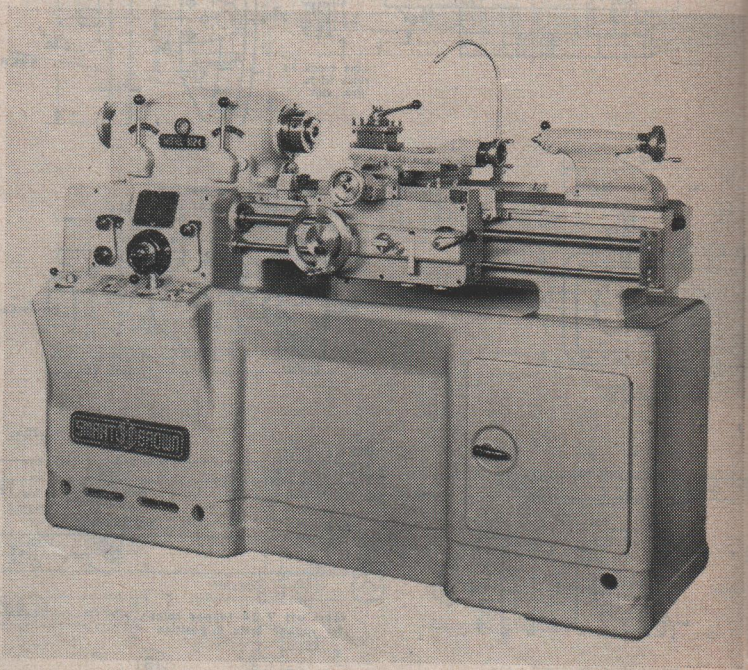

Top edge of frames
Eccentric throw 5/16"
3 13/16"
5/8" D
Lifting arm
Lifting link
link
C L
View of link
Valve rod links
CL
CL
Motion plate
View of guide
View of rocker
Both looking forward
4 1/8"
2
No. 30
No 30
1/8" rivets
No 41 holes to suit bushes
Cut out to dotted line if crosshead pump is fitted
2 1/4" stroke
37/64"
55/64"
Ream 3/16"
Link block 1/4" thick fit to link slot
Ream 3/16"
23/64 B
5" R.
2 9/16"
5 3/8" R
3/32" steel csk. rivets
CL of lifting pin to be exactly 3/32" behind CL link slot
Press fit and rivet
3/8" x 3/8" x 1/8" angle
5/32"
14
4
5
2 3/8"
9/16"
5/32"
1 5/16"
7BA wedge adjusting bolt
Slide bar 7/16" wide
11/16 B
1 1/2"
3/4"
1 1/4"
3/16" x 40T
7/8"
7 BA
1" PCD
9/16 SD
1 1/16"
9/32" ream
1/2"
1/16"
9/32"
7/32"
1/8"
11/16 D
1/4" D
3/32"
Spigot 11/16 D. close fit in body
7/16" R
3/16"
No. 41
18
3/8 -.005
5/8"
9/16"
1/16 R
3/4" to suit CF
1"
1 1/8"
1/4"
3/8" .005
7/32"
5/32" x 40T
1 25/32"
1/32"
3/16"
No. 60
1/4"
7/8"
No. 41
Top bars only
1/4"
7/16"
5"
Mark off 7 BA tapped holes for rocker brkts. in position
1/4" x 7/8" ground stock
19
7/16"
9/32"
1/4" x 40T
9/32" D
Nut 1/8" thick
23/32"
20
33/64"
3/16" D
5/32"
C'harden pin
Taper pin
7/8"
9/16"
1/2"
1/4"
9/64"
3/16"
7/32"
1 1/4"
8
1/16"
13/32"
3/32"
Forward rod
1/16"
3 7/8"
3/8"
7/32"
5/16"
5/8"
9/32"
7/8"
No 30
3
Backward rod
1/8"
11/32"
Case harden pins flush with jaws tight press fit Running fit in link
3/16"
5"
1 5/8"
3A
5/16"
9/32"
No 27
1 5/8" D
4 BA
3/4" bore
Nominal setting 66° behind crank. This gives 1/64" negative lead in full gear and 1/64" positive at 25% cut off
1
3/16" D
1" R
No. 60
1 5/8" D
Running fit on sheaves
No. 40
No. 30
1 3/8" x 5 BA bolt with lock nuts
1 1/8"
1 13/16"
2 1/16"
7/16"
3/4"
5/16"
2
9/32" -.001
5 BA
1/2"
3/4"
7/8"
3/16" R
3/32"
1/8"
5/8"
3/16" ream
No. 41
Spindle hole should be drilled and reamed before bringing base to size
15
11

HOW WOULD YOU LIKE ONE OF THESE LUXURY LATHES?

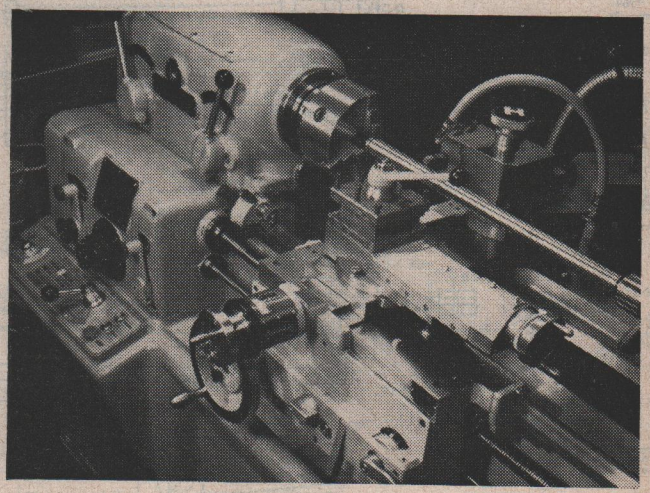
asks Martin Evans



Hardinge high-speed precision lathe, Model HLV



Smart and Brown Model 1024. Below is the hydraulic copying attachment



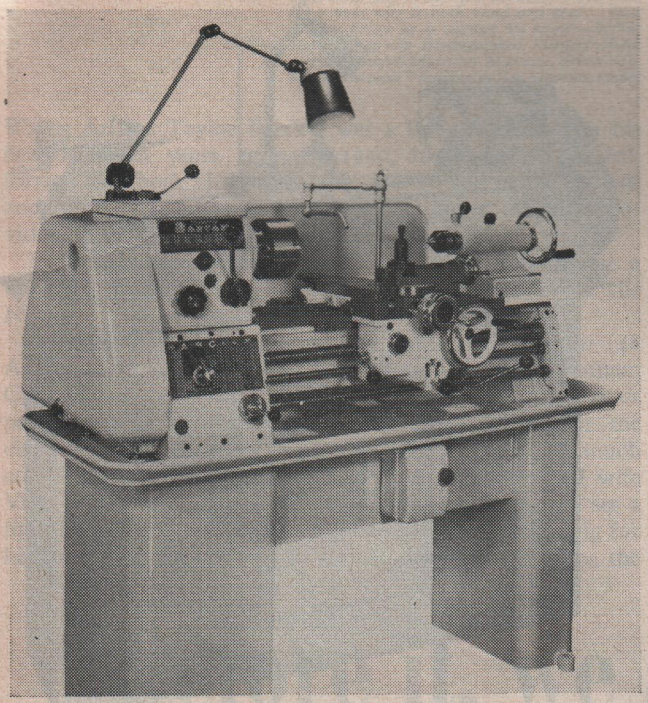
WITH the rapid improvement in the design of machine tools for the engineering industry, it is inevitable that a gap should develop between these tools and those which are used by the average amateur. If we go back about thirty years, we find that the smaller centre lathes employed by professional shops and by institutes, technical colleges and the like were identical to those in the workshops of many model engineers. The same is not true today, and the gulf between the amateur and professional workshop grows wider all the time.

I am sometimes asked whether one of these ultra-modern, highly-sophisticated lathes would really prove more useful to the average model engineer, assuming that he could afford it, than the kind of machine to which he is accustomed. The answer depends mainly on the equipment—whether we have a milling machine, shaper, and so forth—and on the type of work that we propose to do.

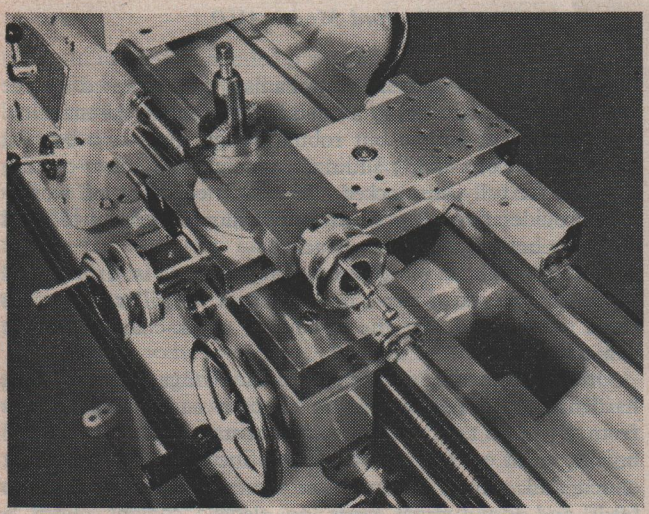
The modern professional centre-lathe is a superb machine for straightforward centre-lathe work—for plain cylindrical and taper turning, for drilling and boring, and for screw-cutting—but it does not necessarily lend itself to some of the jobs which the model engineer does on his machine. As the builder of engineering models expects his lathe to take over the duties of a horizontal and vertical milling machine, a gear cutter, a cylinder boring machine and so on, the question of a range of suitable accessories is of great importance to him.

However, for many of the tasks of the model engineer, the high-priced professional centre-lathe will do a better job, and do it much more quickly. The heavier build of the machine, and the larger bearings alone, obviously contribute greatly to the rapid removal of metal, while the better fit of the slides and the finer correctness of the working parts contribute to superior accuracy and finish, with less effort on the part of the operator.

I am not advocating that model engineers should ruin themselves financially by buying a high-priced lathe which they cannot afford ! On the contrary, some of the finest work in modelling has been done on the very cheapest lathes, machines of 2½ in. to 4 in. centre height which might have cost £5 to £15 before the last war. But even if most of us

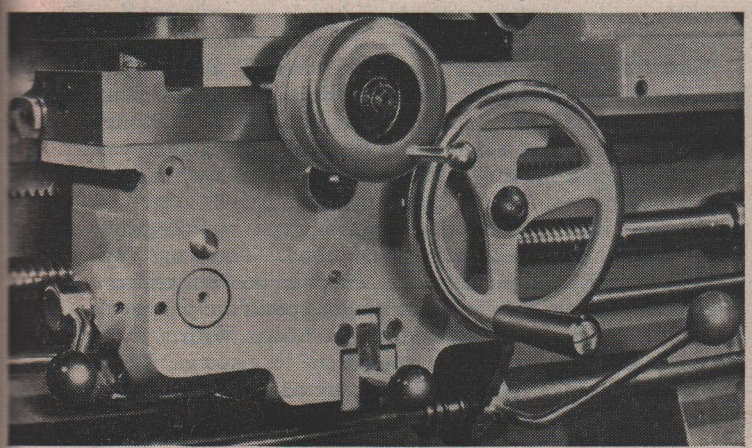


Colchester Bantam



Bantam cross slide

Bantam carriage and apron



are unable to buy one of these super-lathes, I believe that many will be interested in descriptions of some of them.

Let us begin with one of the most expensive of the screw-cutting lathes in the 3½ in.-5 in. centre class, the Hardinge high-speed precision lathe, model HLV, manufactured by the Hardinge Machine Tools Ltd of Feltham, Middlesex. This machine has a swing over the bed of 11 in., and over the carriage of 9 in. It takes 20 in. between centres, and the hollow mandrel takes 1¼ in. diameter.

The most noticeable feature is the unusual bed. Instead of the double-raised V, with a gap between the slides, we have a hardened and ground bedway, made from a steel alloy casting and fitted to a box-section of semi-steel. With this design, Hardinge claims that there can be no lifting action of the carriage, while the angular ways are completely covered, preventing swarf from collecting on them. Between the self-contained bed and the welded steel pedestal base three spherical seats provide a three-point bearing for sustained accuracy.

The spindle runs in high-speed heavy-duty pre-loaded ball bearings which are permanently lubricated and require no adjustment. The collets seat directly in the internally ground surface of the spindle, eliminating sleeves. Instead of being threaded, the spindle nose is tapered and has a special locking device for the attachment of chucks, face-plates, and so forth.

Infinitely variable speed

An infinitely-variable speed arrangement permits a maximum speed of 3,000 r.p.m. The speed is altered by the large handwheel at the front of the machine: alterations in speed can be made while the tool is cutting, so that the operator can quickly select the most efficient rate for the job in hand.

Another interesting feature is the independent electric variable feed, arranged for both carriage movement and cross-slide. While the lathe is running, the simple turning of a knob alters the carriage and cross-slide feed to give the most efficient chip removel and the best finish for the work being done. The rate of feed can be changed instantly at any time, while the tool is cutting, thus saving valuable time.

For screw-cutting, we have a special gearbox used for this purpose only. Threads can be cut from 11 t.p.i. to 80 t.p.i., or to 250 t.p.i. with additional change wheels. A quick-acting toolpost slide provided for screw-cutting is combined with automatic thread-length control. At the end of the threading cut, the tool is instantly cleared from the work for the return of the carriage to the next cut. This is accomplished by a lever which operates the toolpost slide quite independently of the toolpost feedscrew.

The tailstock is also of interest. Its spindle has a constant length of bearing in the body, however much it overhangs at the front end. While the body is cast solid, the handwheel incorporates a ball race to absorb tool-thrust. The spindle is graduated in eighths of an inch, and the handwheel has a large adjustable black and white dial graduated in thousandths and easy to read.

Extra equipment which can be obtained includes the usual range of collets, the collet ball-bearing lever-type quick-closing gear, and a radius turning attachment, an automatic-indexing four-tool turret, a taper turning attachment, a lever-operated tailstock, and hydraulic copying equipment.

Among the many notable features are the very large handwheels. The dials have black figures and divisions on a white background, and are very easy to read, even at a distance.

The cabinet stand includes a built-in tool compartment, and is mounted on special anti-vibration feet.

The lathe is expensive. But as this brief description shows, nothing has been neglected that could have added to its usefulness, accuracy and performance.

* * *

We come to the centre lathes manufactured by Smart and Brown Ltd, of Biggleswade, Bedfordshire. This well-known company has a very high reputation for fine lathes, and is at present concentrating on two models in the 3½ in.-5 in. range, the type A, Mark II, and the new type 1024.

The 1024 precision toolroom lathe swings 11 in. dia. over the bed, and 6¼ in. over the carriage. It takes 24 in. between centres, and the hollow mandrel accommodates bar up to 1¼ in. dia. The bed is more conventional than that of the Hardinge, having twin Vs and flats to support and align the headstock, saddle and tailstock. It is cast in a special nickel-iron alloy and is flame-hardened on the bedways.

A substantial headstock has a spindle carried on double-row roller bearings, the spindle-driving pulley being independently mounted on ball bearings. Of the twelve speeds provided, six are obtained through helical back gears which can be brought into use by the movement of a single lever and are completely disengaged when not in use. The spindle nose is of the American camlock type.

The screw-cutting gearbox, which uses separate drive to the carriage, gives 40 different pitches. All gears are totally enclosed and automatically lubricated, and all shafts are mounted on ball bearings.

To ensure the greatest possible rigidity during turning, both the carriage and the topslide have unusually long bearing surfaces. The topslide has a long traverse and swivels through the full 360 deg. An indexing four-way toolpost and a simple English toolpost or one of the American pattern, are provided. A positive stop with micrometer adjustment is supplied for the carriage.

The tailstock has a long graduated barrel and is bored No 2 Morse taper. There is the usual provision for setting over when taper turning is required.

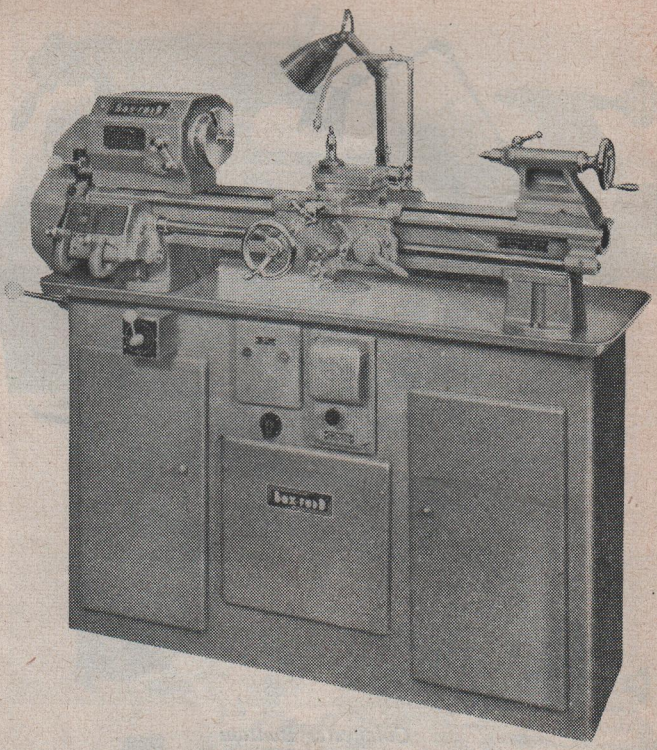
Extra equipment obtainable includes a hydraulic copying attachment, brake and inching control, rear toolposts, taper turning attachment, lever-operated tailstock, turret attachment for tailstock, steadies, and metric conversion wheels.

* * *

From the Colchester Lathe Company one of the largest lathe manufacturers in the world, we have the well-known Student and Bantam centre lathes. The Bantam is a sturdy machine with several features which will appeal to model engineers. Though still fairly high-priced, it is considerably cheaper than the machines so-far described.

With a capacity of 10 in. × 20 in., and a swing over the cross-slide of 7 in., the Bantam is not a large machine, but it is substantially built for its centre-height. The bed is of conventional design, with separate V and flat ways which are induction hardened. It is well ported to allow free fall of swarf and coolant, and is shaped to give maximum protection for the leadscrew and feedshaft.

The headstock is all-geared and totally enclosed. Hardened and honed gears run in an oil bath. The normal speed range from the mandrel is eight, from 36 to 800 r.p.m. Speeds from 36 to 1,600 can be obtained through the fitting of a two-speed motor as an extra. The spindle is carried on Gamet Micron-precision bearings and has a 3 in. Camlock nose. It is bored No 4 Morse and takes 1 in. bar right through. A feed-reversing mechanism incorporated in the headstock is controlled by a knob at the front of the machine.



Boxford Model AUD

An apron of simple but robust design gives two bearing supports to each shaft; sliding, surfacing and screw-cutting controls are fully interlocked. The patented knock-off worm-box provides finger-tip control and allows working to dead stops for both sliding and surfacing.

The cross-slide, of generous proportions, is drilled and tapped to take extra pieces of equipment. A pillar toolpost is fitted as standard, but the Colchester quick-change toolpost can also be had.

Other refinments include a quick-change gearbox with hardened gears running in an oil bath and giving threads from 3.5 to 80 t.p.i. Fifteen different metric pitches can also be cut, from 0.5 m.m. to 6. Extras include Multisize collet chuck and collets, five-position turret bed stops for cross feeds and longitudinal feeds, an electric coolant pump, a telescopic taper-turning attachment, a lever-operated tailstock attachment, and the usual fixed and travelling steadies.

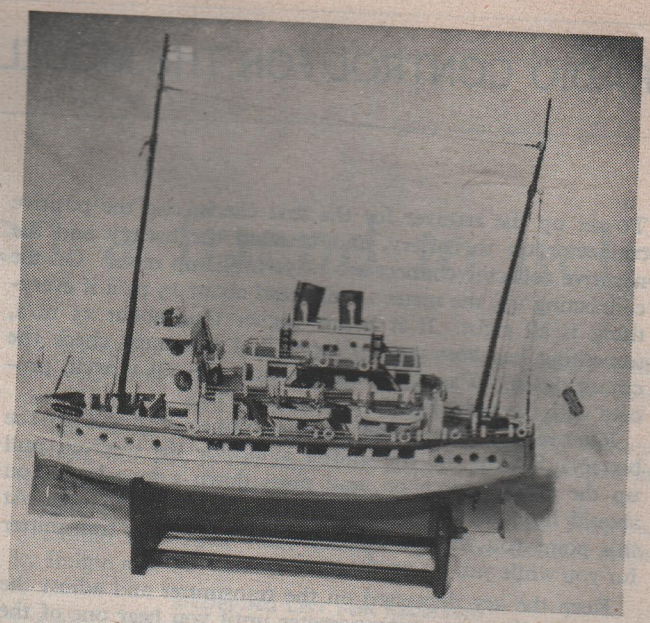
* * *

Next we have the lathes manufactured by T. S. Harrison and Sons Ltd, of Heckmondwike, Yorkshire. The Harrison lathes are produced from 17 in. swing down to 9 in. Model L5, the smallest, has a swing over the bed of 9⅜ in. and over the saddle of 6⅛ in. In the bed is a gap where a 17 in. dia. can be swung.

The bed is of the orthodox double-V type, and the ways are induction-hardened and form-ground. There are two lengths of bed, to give either 24 in. or 40 in. between centres. The head is all-geared and eight spindle speeds are provided, from 34 to 750 r.p.m. or from 45 to 1,000. With a two-speed motor, sixteen spindle speeds, 34 to 1,500 or 45 to 2,000, are possible. The spindle is mounted on twin-opposed

Continued on page 685

This little ship in the ME Exhibition was built by a man who is both blind and deaf. In a picture below he is signing his name—Arthur Bartlett—in the Distinguished Visitors' Book of the National Maritime Museum, Greenwich. He is also seen "looking at" a Museum model



'Before it, we all feel humble'

Tribute to a hero among modellers

WHEN Arthur Taylor Bartlett was a boy of ten he lost his hearing. Ten years later, in 1930, his sight also failed, leaving him both blind and deaf. He worked at the ancient and honourable trade of basket-maker, under the care provided by the General Welfare of the Blind.

For relaxation he turned to another craft. He became a modeller of ships, largely because he had brothers in the Navy.

On returning to his immaculate home in Islington (48 Arlington Street) from the Blind shop in the Tottenham Court Road, he devoted himself to this hobby which most people would consider not merely extraordinary in the circumstances but quite impossible. He modelled by touch and from memory. To help him he had his devoted wife Vera, who was similarly afflicted except that she could see a light and distinguish shapes. When he wanted something for his modelling, she paused in her housework—she keeps the place shining—and handed it to him.

Towards the end of the 1950s he began to make a free-lance model of a small Atlantic liner. He called her the *Perseverance*.

The work of love occupied him for five and a half years, and at the end of it he decided to enter the *Perseverance* in the Model Engineer Exhibition. There she stood, for all to see—the little ship made by a man who possesses neither sight nor hearing. Everyone who saw her marvelled. One after another they said: "I would not have believed it possible."

No people were more awed by Arthur Bartlett's achievement than the staff of ME. In recognition of his triumph over disability this magazine proudly awarded him a Silver Medal bearing the words: *For nobility of effort.*

Arthur Bartlett was a happy man when he learnt of the award and when his friends told him that there was a picture of the *Perseverance* and a long piece about him in the *Daily Telegraph*. But we wanted to do more; and on the Friday we did it, with the enthusiastic help of others.

Soon after ten o'clock in the morning a handsome Victor Britain Daimler drew up at the Blind shop in Tottenham Court Road. It was a car used for taking VIPs to Buckingham Palace, and it had been provided through the kind co-operation of Mr John Rathbone of Victor Britain, who for many years was at Noel Street.

Lapped in comfort, Mr Bartlett travelled across London, accompanied by his friend Leonard Summers, who acted as interpreter through the deaf language, and by Joseph Martin of MODEL ENGINEER who had conceived the idea. He was bound for Greenwich. There, before a magnificent background, Mr Frank Carr, Director of the National Maritime Museum, received him at the Trustees' Entrance.

Mr Carr had already seen the model at the exhibition and had marvelled, like everyone else. In making the presentation

To set up the receiver for the first check, clip the positive connector on to battery, and between the battery and the negative collector connect a 0 to 50 milliamp meter. On the connecting up, the meter should read about 15 m/a if everything is all right. If it is any higher than about 25 m/a, something has been put in awry, and you must check the circuit again. When you are satisfied that all is well, proceed with the next check.

Remove the meter and fit the connector direct to the battery. Set up the transmitter alongside the receiver, pull up the aerial, switch on, and press down a tone key. You should hear the tone reproduced in the reed unit coil. At this point you will need a helper to operate the transmitter for you while you set up the receiver.

Keep the key depressed on the transmitter and adjust the corresponding tone potentiometer until you hear one of the reeds vibrate. If the reeds do not want to vibrate, keep the key depressed and, using the knitting needle screwdriver which you made for the transmitter, adjust the core of the receiver tuning coil, beginning about halfway down, and screw it up or down—whichever raises the volume of noise in the reed unit—until the reed vibrates strongly.

As you adjust the tone pot on the transmitter, listen to the reed unit. When the tone approaches resonance with one of the reeds it will sing much louder. This is the point at which the reed should vibrate if there is enough signal level to operate it.

With your long-suffering assistant still holding down the key, move the receiver away from the transmitter until you can only just hear the reed vibrating. Adjust the receiver aerial core again for maximum sound. As it comes into tune, move further away, retuning until you are satisfied that no further improvement can be made. You then adjust the cores of I.F Transformers Nos 1, 2 and 3, in this order, for maximum volume on the reed unit, moving away all the time that it comes into tune.

The sensitivity of the receiver is such that on the first check you may not be able to hear an absolute peak in volume. If everything appears to be coming into tune, take the transmitter and receiver out into a park or other open space where you can get a long way apart. With your helper still loyally holding down the key, bless his heart, walk away from the transmitter, adjusting the receiver as you go until you get as far away as possible without the reed's going out of vibration. Adjust the aerial coil, move in a little, and adjust it again for maximum volume. When this point is reached, adjust IF 1, 2 and 3 until no further improvement can be made.

Note that the IFT cores must not be screwed down too far or you will force the core on to the lead-out wires of the IF coil. This will cut them and ruin the IFT. You should not have to adjust the IFT cores very much, anyway.

Having got everything going, adjust the other tones by pressing keys one at a time, and adjusting the appropriate pots to tune in the reeds. Use the centre set of reeds as these are usually the most sensitive.

This completes the testing for the present. Our next step is to connect the reeds to the p.c. board. In some reed units

EVERYTHING IN

the reeds are separate pieces of steel, and in others they are all cut from one piece like the teeth on a comb. If they are separate, solder all the connecting ends together with copper wire and continue to the hole marked *C*. Solder a lead from each of the four reed contacts which you are going to use to holes *A, B, D* and *E*. This completes the wiring of the receiver.

Please do not be tempted to twiddle the IFT cores until you are setting up the receiver. The manufacturers set them up on the final test to the frequency which we want. If you disturb the setting too much, they will have to be set up again accurately with a calibrated signal generator which you will not have.

The intergear is the part that translates the radio signals into mechanical movements used to operate controls in a model. Each control is moved by a servo which usually consists of a small electric motor of 3 to 6v geared to the control concerned.

There is a wide scope for experimental work with servos. Electric motors, solenoids and twisted elastic are the most usual sources of servo power, but experiment in the fields of compressed air, hydraulics and direct mechanical drive could well be rewarding. All these are only applicable to power-driven models if we exclude the possibility of carrying a bottle of compressed air on the model.

In the simple form of electro-mechanical control shown we have a rotating shaft driven from the main engine of the model. The shaft carries two metal discs. Between them is a friction roller mounted on a second shaft which can be coupled through gearing to a rudder.

You will see that if the disc carrying shaft is moved longitudinally one or other of the discs will be brought into contact with the friction roller, thus rotating the second shaft and moving the rudder.

I have also illustrated a possible system of electro-pneumatic operation which would provide opportunities for interesting design and accurate work.

Where to shop

Some constructors appear to be having difficulty in deciding which components to buy when they are faced with a choice at different prices.

Transistors are offered at widely varying prices. OC44's vary from 3s. to 9s. each, for instance, and pairs of crystals from 15s. to 70s. I strongly recommend that only top-quality components are used. The quality should be judged from the price; it will not be far below the manufacturer's price which the shopkeeper should be pleased to show to a purchaser.

The crystals must be chosen for their suitability. Third overtone pairs can be had from about 15s. and fundamental pairs at 70s. Both are suitable, provided that the frequency difference between the pair is 470 K/cycles.

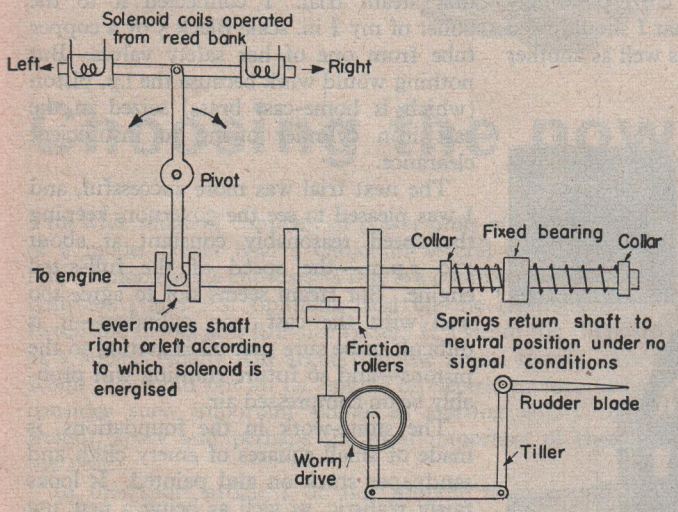
Continued from September 1

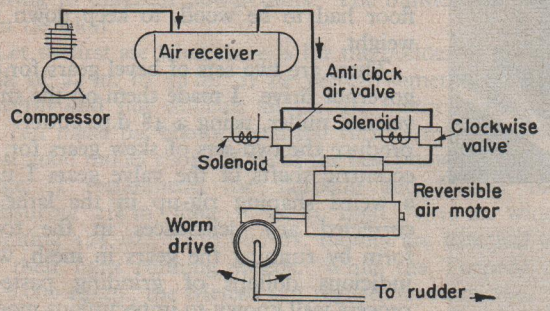
TUNE: You will need a friend to help

In any event, if the crystals are purchased from a reputable supplier and a description of their purpose is given, all should be well. Crystals can be had from Teleradio Ltd, 18 Turnpike Lane, London N8; Catheodeon Crystals Ltd, Linton, Cambridge; and Quartz Crystal Co. Ltd, New Malden, Surrey, as well as from some local model shops.

The aerial should be about $\frac{5}{16}$ in. dia. on the bottom section, but this is not important if the rubber grommet in the case fits whatever aerial is used.

Centre-biased switches can be bought from Henry's, Teleradio and other radio shops. They are usually made by Bulgin and Co. Ltd.





SHOPPING LIST FOR RECEIVER

1	5 pf.	Ceramic condenser
1	10 pf.	,, ,,
2	.04 mfd.	Condensers }
2	.02 mfd.	,, } Hunt's Mould Seal
2	.01 ,,	,, }
3	.1 ,,	,, }
3	100 ,,	,, 12 volt wkg.
1	8 ,,	,, ,, ,,
1	10 ,,	,, ,, ,,
1	50 ,,	,, 25 volt wkg.

All condensers, miniature type, for transistor work.

2	10 k	¼ watt Resistors	10% tolerance
2	56 k	,, ,,	,, ,,
1	3.9 k	,, ,,	,, ,,
1	3.3 k	,, ,,	,, ,,
1	47 k	,, ,,	,, ,,
4	1 k	,, ,,	,, ,,
1	680 ohm	,, ,,	,, ,,
1	8.2 k	,, ,,	,, ,,
2	4.7 k	,, ,,	,, ,,
2	22 k	,, ,,	,, ,,
1	68 k	,, ,,	,, ,,
2	2.2 k	,, ,,	5% tolerance
2	100 ohm	,, ,,	,, ,,
2	4.7 ohm	,, ,,	,, ,,

It is essential that tolerances are adhered to; 10% is indicated by a silver band on the resistors and 5% by a gold band.

1	1.5 Micro-Henry choke (Henry's Radio).	
1	C902 Transformer (Henry's Radio).	
3	IF Transformers	BHO1 }
		BHO2 } Henry's Radio.
		BHO3 }
1	¼ in. coil former with core	
2	Mullard AF115	Transistors
2	,, AF117	,,
1	,, OC81D	,,
2	,, OC81	,,
1	,, OA81	Crystal Diode

1 pair Miniature battery connectors.
1 ten-bank reed unit (REP or similar) from Teleradio or your local model shop.
PC board etc., as required.

To be continued

'Before it, we all feel humble'—*Continued from page 675*

he said that the National Maritime Museum was honoured to welcome Mr Bartlett. Of all the models which the Museum possessed, none represented such courage and determination as Mr Bartlett had shown in building his well-named *Perseverance*. His heroic achievement would be an inspiration to the readers of MODEL ENGINEER in more than sixty countries. "Before it," he added, "we all feel humble."

In thanking Mr Carr for making the presentation at the finest ship museum in the world, Mr Martin said that the *Perseverance* would give pleasure to one reader in particular —to that certain living Immortal, John Masefield the Poet Laureate, who delighted in models and had always honoured the struggle of the individual against adversity: the courage of men like Arthur Bartlett, who had worked for five and a half years in darkness and silence to build his little ship. "The *Perseverance*," he concluded, "can be seen as a symbol of the unconquerable human spirit."

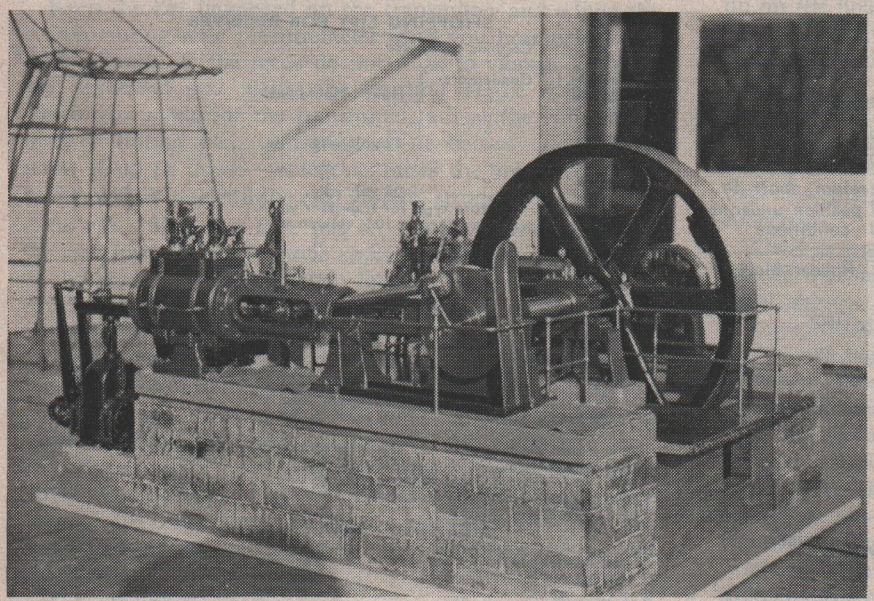
Afterwards Arthur Bartlett signed the Distinguished Visitors' Book, which contains the signature of the Queen, and Mr Carr told him that the official report of the presentation would be read by Prince Philip, who took a close interest in the Museum. All present in the room—they included Commander W. E. May and Mr Arthur Waite of the Museum, and Mr Richard Burwood, who made a recording for the BBC—were greatly moved when Mr Bartlett ran his hands over some special models which are kept for parties of blind children. He said that he would be very pleased to "look at them." At one point, after touching a ship's launch, he uttered the one word: "Clinker."

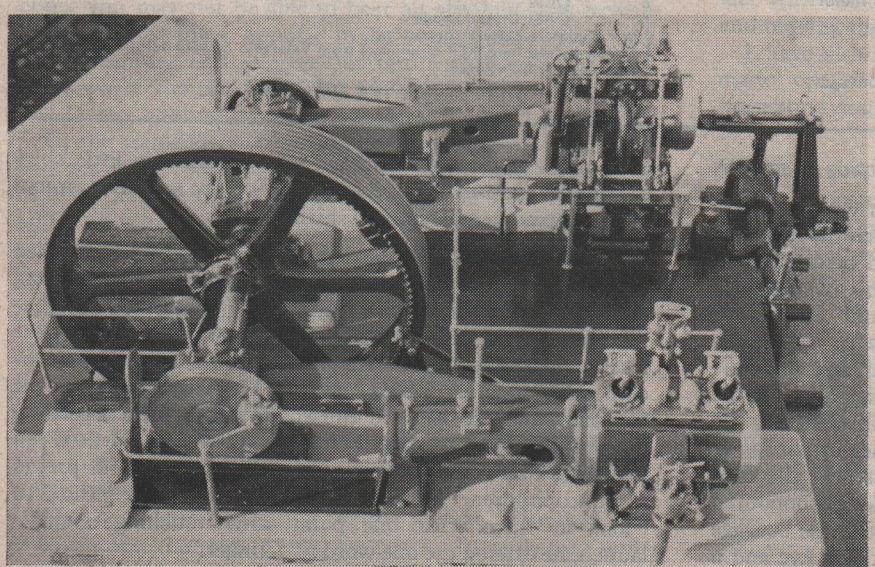
Must this model Robey become a holiday camp for spiders?

After making a handsome engine, Alex S. Wilson in Perthshire wonders what he can do with it!

OUR Robey Class E compound condensing engine is probably one of the few surviving steam mill engines in Scotland, and as there is some doubt how much longer it will survive I thought it would be a good idea to make a model of it before the men with the big hammers came.

I decided on a scale of 1 in. to the foot so that the flywheel (the biggest part) could just be got into my small lathe. I had not proceeded far before I wished that I had chosen 1½ in. to the foot, as some of the small pins in the drop valve gear are about $\frac{1}{16}$ in. dia. in the smaller scale, and a good many of them are split-pinned. The eccentric sheaves are $\frac{7}{16}$ in. dia. and other parts are correspondingly tiny. It became obvious that I should need ten 12 BA taps and dies, as well as another pair of spectacles!





The only iron castings are the flywheel with seven rope grooves, and the low and high-pressure cylinders. Any other small castings I did myself, mostly in light alloy. A great many other parts were fabricated by welding and brazing. Pattern making was almost eliminated.

Had the two trunk guides been castings, two patterns would have been needed (one right and one left) as well as cores. By welding (and brazing) these two parts out of odds and ends of steel the moulders were spared a headache, and a better external finish was achieved.

After about eight years' work the day dawned when the model was ready for its first steam trial. I connected it to the boiler of my ¾ in. scale Black 5 by a copper tube from one of her safety valves. But nothing would work because the l.p. piston (which is home-cast brass) seized in the cast iron cylinder owing to insufficient clearance.

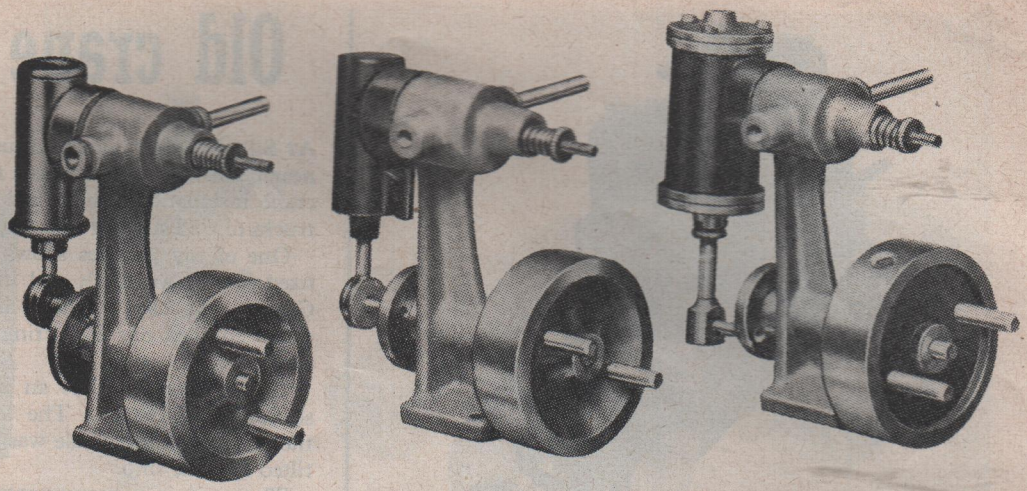
The next trial was more successful, and I was pleased to see the governors keeping the speed reasonably constant at about 120 r.p.m.—the speed of the full-sized engine. But steam seems not to agree too well with the cast iron cylinders—it is difficult to be sure that oil is getting to the pistons—and so future running will probably be on compressed air.

The stone-work in the foundations is made of small squares of emery cloth and sandpaper stuck on and painted. It looks fairly realistic, as well as being a new use for old sandpaper. The foundations and floor had to be wood, to keep down the weight.

There are two sets of bevel gears for the governor drive. I made them on the small vertical miller, using a 48 d.p. cutter. To produce the two sets of skew gears for the eccentric shafts of the valve gears I used a weird shaping rig-up in the lathe. I corrected any deficiences in the tooth form by running the gears in mesh, with judicious dollops of grinding paste—a process well known to impecunious model-lers.

Now that the model is finished I am wondering why I made it and what to do with it. I suppose it will just collect dust and become, like so many of our models, a sort of Butlin's Holiday Camp for spiders. ■

Model Stationary and Marine Steam Engines by K. N. Harris has just been reprinted. The author, well-known to readers of ME, analyses various engines, with illustrations of models, and explains points of construction. Price is 15s., from these offices, or 16s. by post.



These three double-acting oscillating engines are offered by the Web Model Fitting Company. Below, on right, is a complete steam plant from Stuart Turner

Choosing the power for a model ship

While a little vessel should ideally be driven in the same way as the full-sized craft which she represents, other factors may be placed first says Oliver Smith

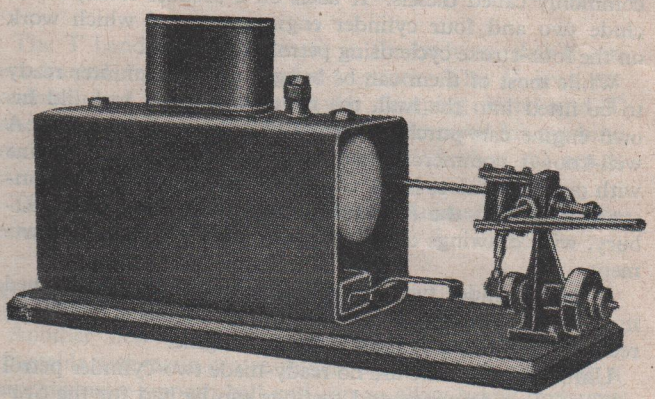
THE wide range of commercial power units offers the builder of a model power boat a choice of several engines for his hull. Among some enthusiasts this is a controversial question, with hard and fast opinions held on the relationship between the model and full-size vessel. If a steam tug is chosen as a subject, many will argue that the model should have a steam plant and not an i.c. engine or electric motor. Others consider such important points as starting ability, noise, weight, space and perhaps the most important of them all the cost.

In this short article I do not propose to enter into the arguments, but merely to state some of the facts and figures relating to different power units. The builder can make his own decision.

Let us first see what there is for the builder of the smaller hull, of 24 in. to 36 in. If he prefers something quiet and peaceful and not difficult an electric motor is the answer. He can make his choice from the various makes stocked by most good model shops. One of the best known is the Taycol range. I recommend the Torpedo and Meteor models. Measuring $2\frac{11}{16}$ in. long × $2\frac{3}{4}$ in. high × $1\frac{5}{8}$ in. wide and weighing $12\frac{1}{2}$ oz., these two 6v. motors are identical except for their light running speeds. While the Torpedo clocks up 6,000 r.p.m., the Meteor can register an extra 500.

Then there is the Super Q Kako S and Orbit 605, two motors of similar power but slightly smaller in overall dimensions—a difference which may be an advantage. The prices range from just over 30s. for the Orbit 605 to just under £2 for the Meteor.

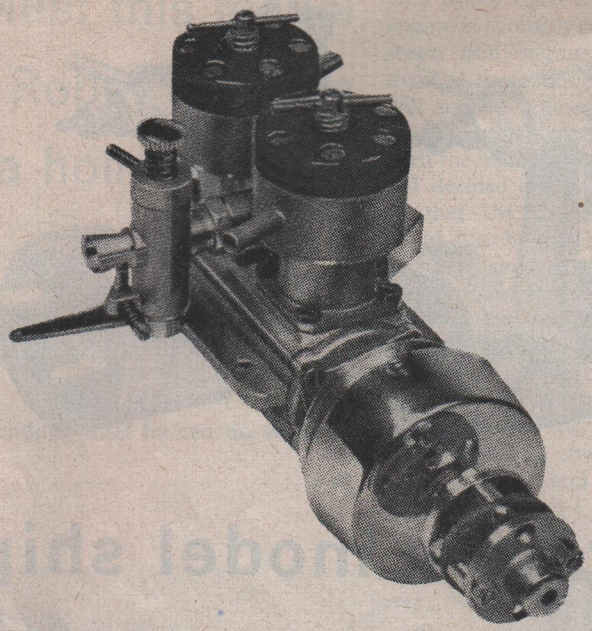
For some the smell of a mixture of hot steam and oil has no equal. They argue happily that the steam engine is the only power plant which has a soul. There are several small double-acting oscillating steam engines to interest them, or they may prefer a simple slide valve type. Well known advertisers such as Stuart Turner, the Web Model Fitting Co., and the Precision Model Engineering Co., all include engines of this kind in their range. The size of bore and stroke varies between $\frac{7}{16}$ in. × $\frac{7}{16}$ in. for the small oscillators to $\frac{3}{4}$ in. × $\frac{3}{4}$ in. for the larger slide valve engines. Stuart Turner supply a service whereby a complete engine can be bought ready for fitting straight into a hull. The man who likes to build his own engine can get a set of parts.



The third form of power unit is the small i.c. engine. This little demon can emit a sound capable of shattering the peace and tranquility, not only at the pondside, but of the surrounding district. They are very popular—perhaps I should add therefore—with junior boat builders. These young tyros, with a kit which can be assembled in a short time, usually want a power unit which is ready for installing without too much difficulty and is also too expensive.

There should be no problem in selecting an engine to suit the desired performance of the model. The products of several manufacturers offer a combined range from 0.5 c.c. to 2.5 c.c., at prices from just under 50s. Exhaust manifolds and silencers can be fitted as extras by the owner at a small cost.

A regard for the interests of others, those who are irritated by the sound of these engines, will be for the good of all. This applies in particular to boats of over 36 in. o.a.l. powered by engines of 5, 10, 15 and 30 c.c. As we move to-



Latest from Taplin: a 15 c.c. twin two-stroke

wards the higher rated power plants, the hobby becomes more adventurous and exciting because there is more variety in the types of engine. No longer is the choice restricted to the two-stroke single-cylinder compression ignition engines, commonly called diesels. It takes on a broader front, to include two and four cylinder engines some of which work on the four-stroke cycle using petrol as their fuel.

While most of them can be bought over the counter ready to be fitted into the hull, the man who wishes to build his own engine can purchase sets of castings and drawings. A well-known commercial four-stroke single-cylinder engine with overhead valves is the *Gannet* 15 c.c. For the home constructor there is the *Kittiwake* designed by Edgar T. Westbury, with drawings obtainable from the ME Plans Department.

A twin-cylinder two-stroke which has already established itself as a favourite with builders is the Taplin 8 c.c. Twin, recently joined by a 15 c.c. companion engine.

Unfortunately there are no ready-made two-cylinder petrol engines. But drawings and castings can be had for the *Seagull,* a 10 c.c. side-valve water-cooled four-stroke engine ideally suited for a model boat.

For the connoisseur who wants to grace his hull with a power unit more in keeping with those used in full size practice, there are drawings and castings of the four-cylinder side-valve, water-cooled, 15 c.c. *Seal,* and of a companion engine of 30 c.c. with overhead valves, the *Sealion.*

The steam enthusiast can generate the pleasant aroma of hot oil and steam by fitting one of the engines offered by Stuart Turner. Their Double 10 is used by most ship modellers, but there are other engines such as the Sun and the Sirius which are all suitable for the larger hull. Model tug builders who can afford to fit a heavier plant for the large displacement of this type of model may find what they need in the Stuart compound. This plant is very compact for its output; it measures 5½ in. high × 5¼ in. long and weighs 4 lb.

For the larger model, such as a liner or a capital ship, the Stuart triple can be considered. ▣

Old crane at Silloth

At Silloth, a tiny, almost disused port on Solway Firth quite near Carlisle, I came across a rather interesting old fashioned crane installation, which had been used for tipping ten-ton trucks of coal straight into ships' holds.

One of my pictures shows a massive rotating crane with fixed jib. It was built and installed by Sheldon Cowans of Glasgow in 1877. There are two separate twin-cylinder steam engines, one for lifting and the other for turning the whole device.

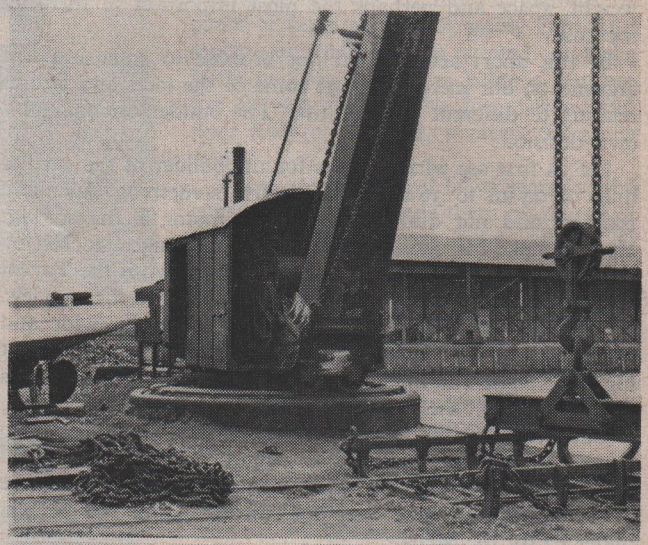
In the foreground is an iron cradle which fitted into a section of the track. The truck was merely shunted into the cradle and the whole was then dumped over the side and tilted into the ship.

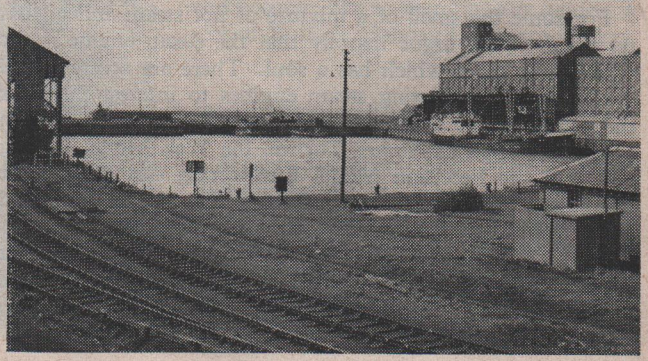
The unit is a monumental piece of work. A very old weight certificate cut into the stonework of the pedestal says that the crane could lift 25 tons.

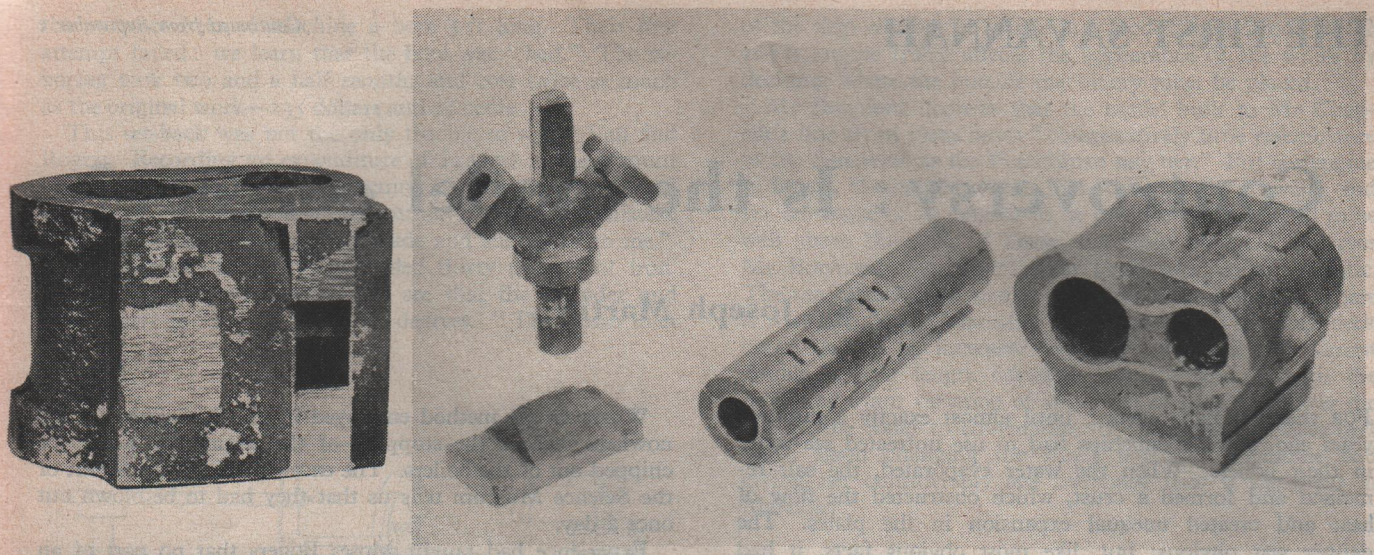
I was told by a man who was busy painting his boat that the crane was used occasionally and was in rather doubtful repair. The red line on the pressure gauge of the boiler indicated a SWP of 140 p.s.i.

The other picture is a general view of Silloth harbour with the huge hydraulically-operated dock gates at the end. The gates are still opened and closed at every high tide.

Peter Scott.







Castings for Caribou

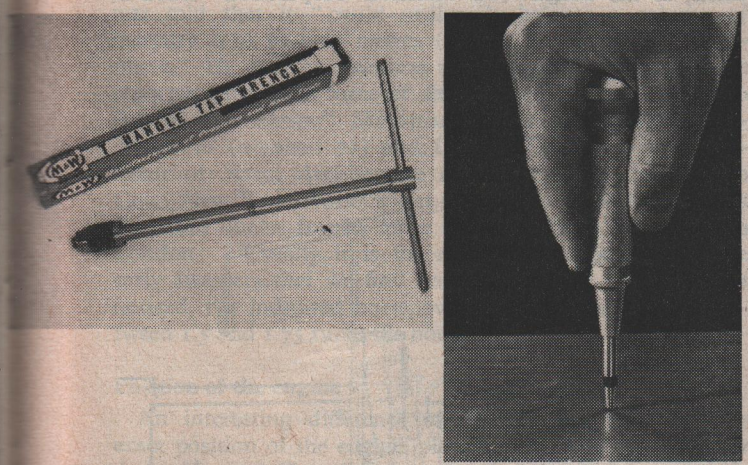
Dore Engineering, of 1 Drury Lane, Dore, Sheffield, who are well-known for their supplies of model engineering castings and materials, have sent us samples of some new castings for the 3½ in. gauge locomotive *Caribou*.

As can be seen, the cylinder castings have the exhaust passages properly cored out, saving much difficult drilling and milling. The valve liners are also slotted.

Dore Engineering supply a cast Y pipe for the exhaust, matching the special exhaust manifold for this engine. It is complete with drawings and machining instructions.

Other parts supplied are cast domes which need no machining underneath to fit the boiler, and smokebox front castings with hinges, dogs and angle rings.

The castings examined were all in good-quality gunmetal. They are confidently recommended.



New tap wrenches

Moore and Wright Ltd, the well-known manufacturers of fine tools, have recently introduced some new tap wrenches. They are of the T handle type, and are offered in no fewer than six sizes. The smallest is 2¼ in. long and takes taps up to $\frac{5}{16}$ in. Other sizes are: 3⅛ in. long for taps $\frac{5}{16}$ in.-$\frac{5}{16}$ in., 3$\frac{13}{16}$ in. long for taps ¼ in.-½ in., 6$\frac{5}{16}$ in. long for taps up to $\frac{5}{16}$ in., 10⅛ in. long for taps $\frac{5}{16}$ in.-$\frac{5}{16}$ in., and 13$\frac{5}{16}$ in. long for taps from ¼ in. to ½ in.

Around the TRADE

The T handle is a friction fit in the body, so that it can be adjusted for use in confined spaces. The V jaws are hardened and replaceable, and the clamping barrel and T handle are also hardened. As the body is centred for machine use, accurate alignment can be maintained when the tap is started.

These wrenches are well-made and finished and can be recommended.

Automatic centre punch

Another new production by Moore and Wright is an adjustable automatic centre punch, a heavy duty tool with a large diameter smooth ball end cap to allow heavy pressures to be applied without discomfort.

The mechanism is enclosed in a knurled, pearl chrome-plated body. All working parts are made of tool steel, hardened and tempered. The depth of impression is adjustable by the ball end cap, and operating pressures can be set between 14 lb. and 50 lb.

A useful feature is that the punch itself can be replaced without our having to remove the whole of the punch holder. Punches can be supplied with a panel pin point or a special mark, number or letter on the end instead of a punch point.

Points can be had with single characters up to ⅛ in., double characters up to $\frac{5}{32}$ in., and treble characters up to $\frac{3}{16}$ in., suitable for marking on ordinary mild steel. The centre punch is $\frac{23}{32}$ in. diameter over the body, and the closed length is 5$\frac{7}{8}$ in.

This new automatic centre punch is well made and finished, and its operation on all types of metal is excellent. Moore and Wright products are sold by all good tool dealers and suppliers of model engineering equipment.

Continued from September 1

Controversy: Is the model correct?

By Joseph Martin

FOR the first half-century, until almost exactly a hundred years ago, ocean steamships had to use untreated sea-water in their boilers. When the water evaporated, the salt remained and formed a crust, which obstructed the flow of heat and created unequal expansion in the plates. The danger was obvious; but, like most obvious facts, it had to be emphasised again and again. Twenty years after the *Savannah* sailed, between 1837 and 1839, no fewer than ten explosions occurred in steamships, not including the disasters, probably from the same cause, to the *Killarney, Forfarshire* and *Northern Yacht,* all of which came to a mysterious end in 1838 with the loss of 114 lives.

From the time of James Watt, various condensers were invented, but loose joints and difficulties in manufacturing the tubes made them more or less ineffective. Nor were the brine-pumps introduced by Maudslay and Field as great a boon as they promised to be; engineers complained that the pipes discharging the brine from the lower part of the boiler were apt to become choked.

Blowing-out

When the *Savannah* visited St Petersburg in the course of her travels a Russian journalist noted a feature of her mechanism which was not mentioned by Marestier: "Thanks to a new and very clever invention which is as yet unknown in Europe, not the slightest salt sediment remains in the boilers although sea-water is continuously boiled in them. Thus the *Savannah* need not have her boilers cleaned out a single time, although she had already come from America to Kronstadt and is soon to return there."

What was this clever invention? Mr Braynard in his book has no suggestion to offer. I suspect some form of blowing-out, the commonest method of preventing the sediment from becoming a danger. Blow-cocks were placed in the lower part of the boiler where the over-salted water collected. "The presence of the steam and incumbent weight of the water in the boiler," wrote the famous Dr Dionysius Lardner in his *Steam Navigation,* "force the lower strata of water out through these cocks; and this process, called *blowing-out,* is, or ought to be, practised at such intervals as will prevent the water from becoming over-salted."

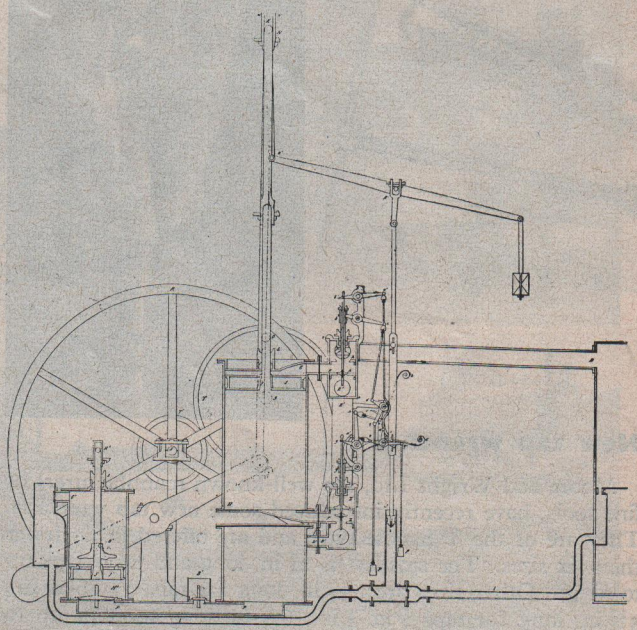
The engineer had to use his judgment in deciding when, and for how long, he should open the cocks. In some of the engines built by Seward's of Limehouse this responsibility was lightened by the use of a gauge which depended upon two hydrometric balls. When the solution in the boiler was of the same strength as ordinary sea-water, both balls fell to the bottom; when the salt exceeded five thirty-seconds of the whole weight, the lighter ball rose to the top; and when the salt increased by another thirty-second part, the heavier ball rose.

Whatever the method employed in the *Savannah,* her log nowhere records the stopping of the engine for salt to be chipped out of the boilers. The excellent H. Philip Spratt of the Science Museum tells us that they had to be blown out once a day.

Experience had taught Moses Rogers that no part of an engine deserved more attention than the part where the steam was generated. He is said to have rejected five or six of Daniel Dod's boilers—no doubt on paper—before he declared himself satisfied. Every component had to pass his critical eye while it was being made, and in order to be near the Speedwell Iron Works he moved his family from Bordentown to Moristown.

The cylinders were built by James P. Allaire (there is a Deserted Village of Allaire in Monmouth County, New Jersey) who two years earlier had produced the engines for the 496-ton *Chancellor Livingston,* which covered the 165 miles of the Hudson River from Albany to New York in the record time of eighteen hours. No other foundry would have been capable of casting such a large cylinder. It was 40⅜ in. diameter × 5 ft stroke.

These were the final measurements. For more than three weeks the men employed by Stephen Vail—his business still exists, as the Lidgerwood Stabilizer Corporation—toiled in

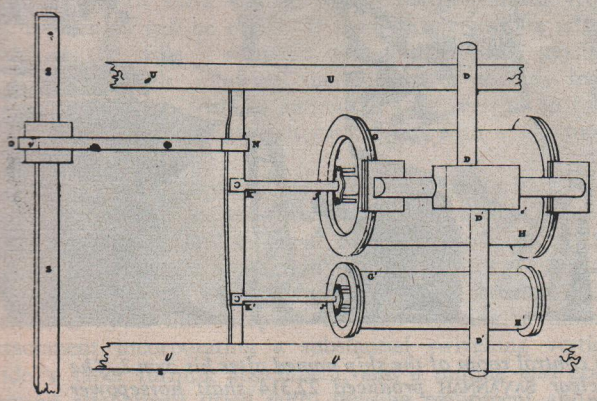


Engine of the CHANCELLOR LIVINGSTON, ROBERT FULTON, WASHINGTON *and* OLIVE BRANCH; *a drawing by Marestier*

the summer heat to machine a bore 5 ft long. Their first attempt failed: we learn that the bore was "bad." The reboring took two and a half months and cost twice as much as the original work—235 dollars and 24 cents.

This set-back was not the only trouble to worry Vail and Rogers. Recording an expenditure of $22.37½ in the account book, Vail wrote: "To lengthening the piston rod with 98 pounds of iron after it had been turned there being a mistake in the draft that Mr Dod had made and submitted to me." The extension of the pump needed thirty pounds of iron.

From Marestier's drawing we see that the cylinder and pump were inclined at about 20 degrees. "The steam inlet



Power for the first SAVANNAH. *Marestier's drawing of the engine*

and exhaust pipes," says Mr Spratt in *The Birth of the Steamboat,* "were of equal bore, since there was no expansion in the cylinder, and the steam was discharged hot and at full pressure to the jet condenser. The air pump for this condenser worked on the same cross-head as the main piston rod."

Mr Spratt adds that the steam pressure "is said to have been less than 1 lb. per sq. in. above atmospheric." Marestier was told that it "could ordinarily balance a column of mercury 0.10 to 0.15 metres (2 to 5 lb. above the atmosphere." He does not mention the horsepower. The Russian reporter gave "the force of the engine" as "equivalent to that of sixty horses." Mr Spratt makes the indicated horsepower 90 (nominal 72) and Cedric Ridgeley Nevitt, Professor of Naval Architecture at the Webb Institute, Glen Cove, New York, works it out as between 73 and 75. Frank Braynard quotes from a letter sent to him by Mr Spratt in London: "Usually it is the nominal horsepower of these early steamers that we find recorded, and as you will have noticed, the indicated horsepower is considerably more, between 1.5 and 1.75 times the nominal."

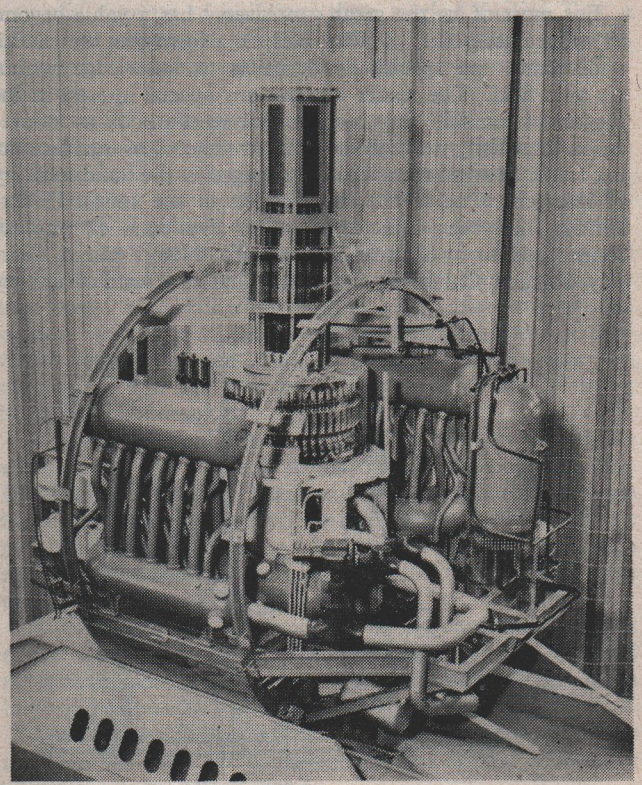
Position of the engine

An interesting difference of opinion also exists on the exact position of the engine, placed by Marestier on the spar deck. Howard Chapelle maintains that the engine could not have been forward of the paddlewheel shaft if Marestier's sketch and dimensions are correct: "The engine was too heavy to be off centre. The sketch shows the stack position ahead of the shaft and this, if laid out to scale, makes it certain the engine was abaft the shaft." To this reasoning Mr Braynard replies that the space aft was even more limited than the space forward. He criticises the departure from Marestier which Mr Chapelle made in his reconstruction for a new model at the Smithonian. While the interior lay-out of the ship will not be visible in a model, the position of the 10½ ft engine frame affects the appearance of the whole by deciding where the outside machinery must be placed.

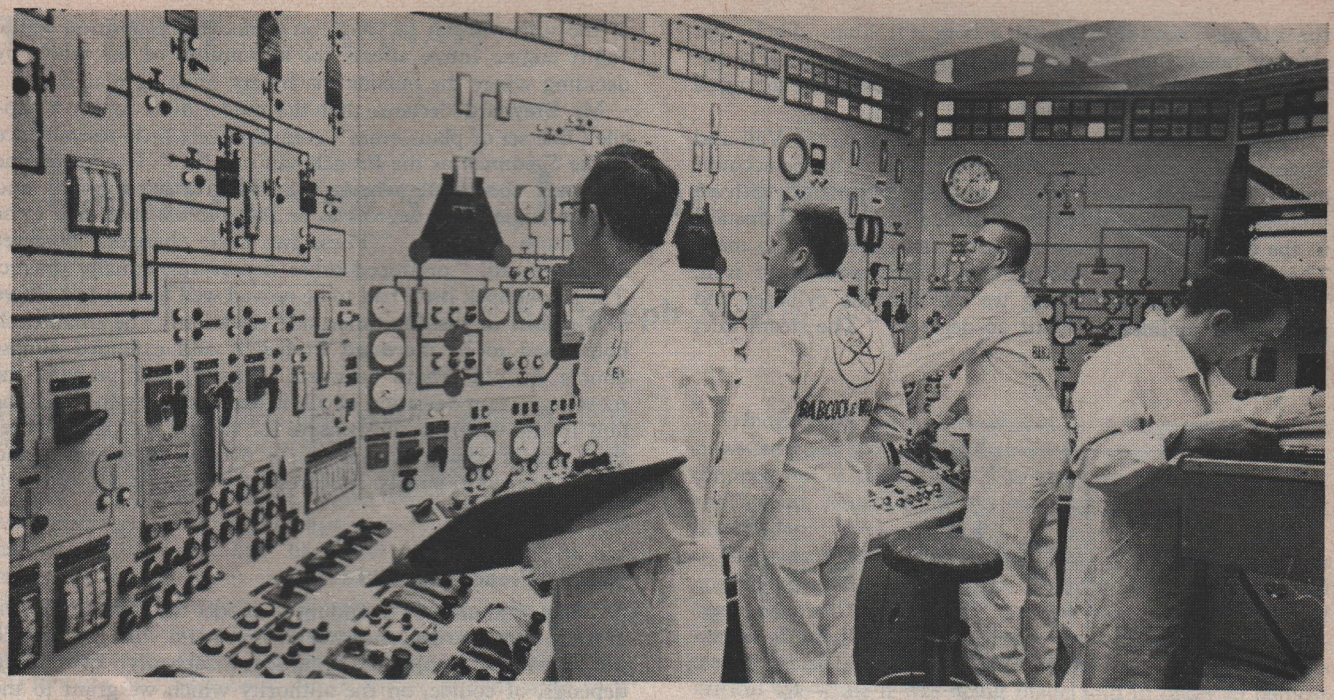
Mr Braynard declares that the model built to Mr Chapelle's fine set of plans bears "comparatively little resemblance to the *Savannah* as the Frenchman saw her." For the engine to be aft, the paddle wheels had to be further forward, and for the angle of 20 degrees to be possible the shaft had to be well above the deck. "These two basic changes," observes Mr Braynard, "produced other departures, equally drastic. The smokestack itself had to be moved well forward of where it is shown in the Marestier side elevation. The small deck house had to be increased in height and extended almost double its old length forward. Finally, and perhaps the most important variation of all, it was necessary to lower the hull in the water to compensate for raising the paddlewheel shaft, again changing the ship's over-all appearance and giving her considerably less freeboard than is indicated in Marestier."

Was the Frenchman right?

Those who are not intending to model the first *Savannah,* or are not otherwise concerned at first-hand with her details, can sit back and enjoy the argument detachedly. Everything depends, of course, on the authority which we grant to the Frenchman. For Mr Braynard, Jean Baptiste Marestier is the well-informed observer on the spot, the brilliant engineer who later designed a steamship of his own. On the other hand, Mr Chapelle is respected across the world for his knowledge of nineteenth-century ships, and in particular as the author of *The History of the American Sailing Navy* and *The History of American Sailing Ships,* classics treasured



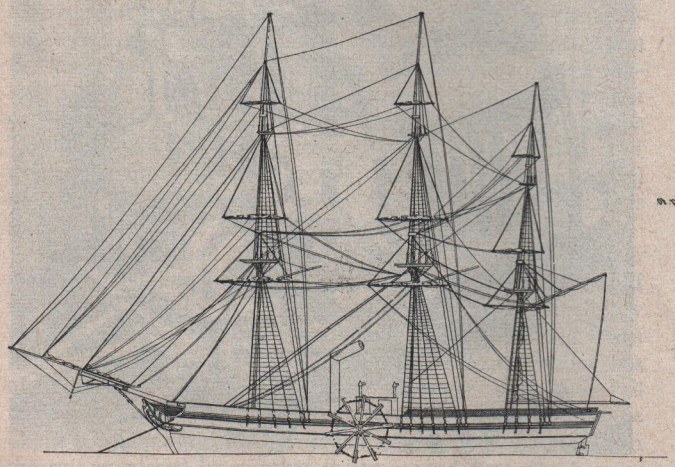
Power for the second



What would Captain Moses Rogers have thought of this—the control room of the ship named after his own? The Babcock and Wilcox propulsion unit for the 22,000-ton nuclear SAVANNAH *produced 22,314 shaft horsepower during trials, moving the vessel at 24 knots. Ordinary water flows through the 32 fuel elements under a pressure of 1,750 p.s.i. to remove the heat. The honeycomb-like core which contains the elements is 62 in. dia. and 66 in. high. One core-loading will last three and a half years and drive the ship for 300,000 miles, doing the work of 90,000 tons of fuel oil. The Uranium 235, only 690 lb. of it, provides the same energy as a million tons of coal*

by many ship modellers, including the winner of the Duke of Edinburgh Trophy at the 1964 ME Exhibition.

For most of us the great controversy has a value beyond its immediate point: it illustrates, in a form that we can all understand, the specialist's devotion to knowledge within his own field. The reader without any special interest in the Elegant Steamship may see Mr Braynard's book as a revelation (especially through the notes at the end) of the fascinating traffic between men who are engaged in the same territory of research. One of the ship models in the 1964 ME Exhibition had been built at sea after five years of research contributed to by sources in Australia, New Zealand, Norway, Sweden, California and Peru. The same kind of activity continues all the time among modellers and among the historians who make models possible; it is practised magnificently in the back-rooms of such great institutions as the National Maritime Museum at Greenwich, the Science Museum at South Kensington, and the National Museum in Washington. The experts co-operate even more freely than they disagree. They represent that true internationalism which goes back to the wandering scholars of the Middle Ages. A reader of ME who works from drawings of, say, the *Revenge* or the *Victory* may have no idea of how the information for the drawings was brought together: such plans may contain the work of more than one lifetime.



Marestier's drawing of the SAVANNAH

There is yet more to be learnt from the *Savannah* controversy. It brings home to us the value of a model in perpetuating information. No half-models or plans of American packets built before 1832 have ever been discovered. If we had a builder's model of the *Savannah* we should know exactly how she looked and there would be no question of differing opinions. As Mr Braynard remarks, the solution lies in continued research, " with the hope that some day an original source will be discovered which will answer the various perplexing engine space problems created by the ingenuity of Moses Rogers, Daniel Dod, Stephen Vail and James P. Allaire." It may be found in the United States, in Scandinavia or in Russia. As President Monroe, the King of Sweden and the Tsar were all interested in buying the Elegant Steamship, Captain Rogers may have provided them with specifications. If a Russian reader of ME delved enough into certain Tsarist archives at the Kremlin, Mr Braynard might have to revise his book or Mr Chapelle prepare the drawings for another model !

To be concluded

LUXURY LATHES

Continued from page 674

bearings at the rear. All gears are hardened and honed and are splash lubricated.

On the standard model the spindle nose is threaded 6 t.p.i. A larger camlock nose which can be obtained has a spindle with a bore of 1⅜ in., compared with 1⅛.

With a Norton quick-change gearbox which gives 36 changes of threads and feeds through a tumbler lever and two compound gear levers, threads can be cut from 4 to 60 t.p.i., and with extra change wheels metric threads from 0.5 to 7 m.m. can be made. If the Norton gearbox is not specified, the lathe is supplied with a three-speed gearbox and changewheels, allowing the cutting of threads from 2.5 to 40 t.p.i. or, with an additional 120t gear, to 80 t.p.i. A range of 18 metric threads can be cut with a 127 tooth gearwheel.

The tailstock is conventional. Its spindle has a long bearing in the body of the tailstock. It is arranged to be set over for taper turning and is bored No 3 Morse taper. Extra equipment includes a six-station bed turret and cut-off slide, a collet attachment, a toolpost grinder with a separate ½ h.p. motor, a 15 in. dia. faceplate for gap working, a milling attachment incorporating a substantial swivelling vertical slide, a taper turning attachment, and a milling and gear-cutting attachment fitted with dividing equipment and an arbor for 1 in. bore cutters.

* * *

We complete this summary with the well-known Boxford lathes. These machines, also manufactured by T. S. Harrison and Sons Ltd, are of 9 in. swing capacity and take 16 in. between centres. Longer bed models are 22 in. or 28 in. The general specification follows the Harrison very closely, the beds being of the double raised V design. The spindles are mounted on twin opposed pre-loaded Timken roller bearings. Their normal speed range is from 38 to 1,300 r.p.m. They are bored No 2 Morse taper and pass ¾ in. dia. bar.

Boxford Mark II centre lathes are arranged for underneath drive and have ten spindle speeds from 40 to 1,400 r.p.m. Power longitudinal and cross feeds through a friction clutch are a new feature.

Ball races are fitted to both cross-slide and top-slide lead screws, so that wear at these points is almost eliminated. The change gear guard has an electrical interlock which stops the machine immediately the guard is opened. Models are offered with a Norton quick-change gearbox and fully automatic apron, with change wheels for threads and feeds and fully automatic apron, or with change wheels and plain apron with longitudinal power-feed-only. ▣

BUSINESS AS USUAL – BETTER IN FACT!

FIRE which broke out at the Sheffield premises of Tyzack Sons and Turner Ltd on the evening of July 13 completely gutted the first storey of the main office block and saw warehouse. But copies of all customers' drawings may still be obtained, though the originals were lost.

Except for a plastic moulding machine used for saw handles, all the plant is now in full production. The turnover for July was greater than it had been for the same month in 1963.

LONE CHIMNEY ON THE MOORS

What happened to Incline Top?

ROSEDALE Chimney is now no more than a landmark on a deserted Yorkshire moor. Yet maps before 1914 show a railway and a group of buildings there marked *Incline Top,* a name that suggests a scene of activity, with sizzling boilers, a powerful winding engine, and wagons ascending and descending.

My model recaptures such a scene. But it can do no more than suggest a likely layout, for all the technical details of Rosedale Incline are apparently lost and forgotten.

In building the model I had to rely on old photographs and prints of similar engineering, such as those in Tomlinson's *North Eastern Railway.* The engine is based on the traditional North Country design, with the crankshaft in the top storey of a tall engine-house and a flat-arm parallel motion taking the crosshead thrust. Other features of nineteenth-century engine-building, such as cottars, are incorporated, and the flywheel is staked on instead of being bored to fit the crankshaft.

A shrouded pinion staked onto the end of the crankshaft drives the winding drum outside the engine house. Inside is the high-back chair so often seen in colliery engine houses, together with levers to operate the steam valve, the gab reversing gear and the brake on the drum. The engine exhausts to the atmosphere through the bell-mouthed pipe on the wall side.

Since I completed the model about eleven years ago it has run at various exhibitions. Many who see it are surprised to discover that it runs on steam. The boiler stands in a low-roofed house in front of the main building.

The cylinder is about ⅝ in. × 1 1/16 in., the drum is 3 in. dia., and the engine-house is 7½ in. × 5½ in. Of course, the chimney is tall—fifteen inches.

FRANK D. WOODALL.

READERS' QUERIES

DO NOT FORGET THE QUERY COUPON ON THE LAST PAGE

★ Queries must be within the scope of this journal and only one subject should be included in each letter.
★ Valuation of models or advice on selling cannot be undertaken.
★ Readers must send a stamped addressed envelope with each query and enclose a current query coupon from the last page of the issue.
★ Replies published are extracts from fuller answers sent through the post.
★ Mark envelopes "Query," Model Engineer, 19-20 Noel Street, London W1.

Sailing ship timber

Could you please tell me where I may get yellow pine wood for modelling sailing ships? The timber merchant near where I live does not stock it.—R.A., Rugby.

▲ *You should be able to find a wood merchant who can supply pine; it is not an uncommon timber by any means. It would be worth your while to write to the secretary of the Rugby Society of Model and Experimental Craftsmen, Mr G. W. Harrison, 43 Percival Road, Rugby; he could probably put you in touch with a local supplier.*

Modelling traction engine

Can you supply me with the plans and instructions for building a 1 inch scale traction engine? The one I have in mind has a lion on the front.—C.B., Shirley, Croydon.

▲ *ME Plans Service can supply a complete set of drawings for a 1 in. scale traction engine (TE1, 17/-).*

Instructions for building the engine are not obtainable, but you will find the serials on building the 1½ in. scale Allchin a great help.

You can probably obtain the appropriate back numbers of MODEL ENGINEER *from Lens, 50 Carshalton Road, Sutton, Surrey. Failing this, a small classified advertisement in* MODEL ENGINEER *would probably have the desired effect.*

Feed-screw

I wish to replace the feed-screw of the cross-slide of my lathe. There is no replaceable nut. The screw runs through a hole bored and threaded in the saddle. It is square-thread ⅜ in. × 10 t.p.i.

Would there be any disadvantage in my using a V-thread Whitworth or BSF and making a replaceable nut? I am aware that the readings on the graduated dial would no longer be true, but are there any other reasons why V-threads are not suitable?—S.F., Wavertree, Liverpool.

▲ *It would be quite in order for you to use a V-thread for operating the feed-screw.*

The reason why it is more usual to employ either square or Acme threads for these screws is that they work with less friction and retain their accuracy longer than V-threads. But the V-thread has been used quite successfully for some types of slide.

Screw threads

I have the PM book *Screw Threads and Twist Drills* which was obviously published before the present effort towards standardisation was introduced. Like many elderly motorcyclists and motorists, I had become accustomed to most of the threads quoted in that book, chiefly Whitworth, BSF, BA and Metric. Now the makers of my latest car refer to HNF threads, which appear to coincide with the American National Fine Threads quoted in Table X of the PM book.

I do not know what the "H" means in the HNF and was surprised at the number of garages where the mechanics were also unaware of it. In fact, some said that they had not yet provided themselves with any of the new taps and dies which one would expect to be needed for certain forms of service and repair work.

It may be that in addition to the Fine Threads to which I refer, the original American National Coarse have also been adopted in the effort towards standardisation.

Is there any publication which gives full details and tables for the new threads and would the more recent issues of the PM book *Screw Threads and Twist Drills* contain this information?—E.C., Hartley, Kent.

▲ *New standard screw threads are constantly being introduced and undoubtedly have advantages for special purposes. The general idea of these new standards, apart from such advantages, is to unify and reduce the number of standards in general use, but unfortunately they become superimposed on the old standards and make it more difficult to keep a full set of tools for threading and tapping.*

The only publication which we can guarantee will give full details and tables for the new thread standards is the list of British Standards specifications for screw threads obtainable from the British Standards Institution, 2 Park Street, London W1.

Lamps for Virginia

I am building a 5 in. gauge *Virginia* and am constructing an oil head-lamp. Is the lamp in the drawings just an ornament? Does the body of the lamp lift off, or is it fixed to the base?—L.W., Cheam.

▲ *The oil head-lamp on* VIRGINIA *is not intended to be an exact copy of the original. There is usually a hinged door at one side to give access to the wick and so forth. The body of the lamp would not be in one piece with the base. There seems no reason why the lamp should not be made to light up, though you would find it much easier to fit a small electric bulb than a wick.*

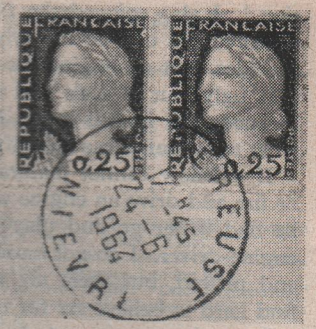
Going to New Zealand

As I am emigrating to New Zealand, I would like the names and addresses of some model engineering societies. Two or three of those in the major centres will suffice.—J.A., Johannesburg.

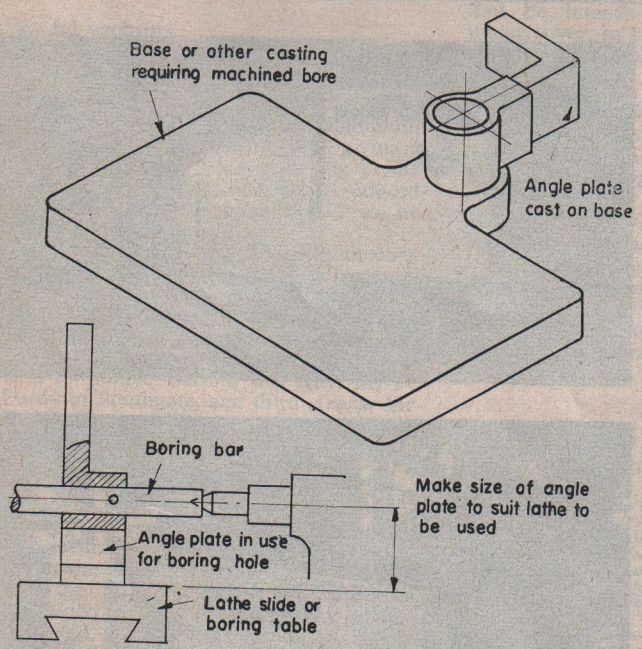
▲ *Here are a couple of addresses: J. C. James, secretary, Auckland SMEE, 40 Plunket Avenue, Papatoetoe, Auckland; and Harold Riddle, secretary, Otago MES, 10 Durham Street, Dunedin.*

The Editor welcomes letters for these columns. A PM Book Voucher for 10s. 6d. will be given for each picture printed. Letters may be condensed or edited

POSTBAG



Tip from Canada


Base or other casting requiring machined bore
Angle plate cast on base
Boring bar
Make size of angle plate to suit lathe to be used
Angle plate in use for boring hole
Lathe slide or boring table

Fred Massey's idea makes the machining of holes much easier

SIR,—In looking over Mr Westbury's dandy little milling machine I am reminded of the way in which I made a drilling appliance.

By casting on angle plates to the parts that could benefit from their addition—all the parts that attach to the column—the machining of the holes was easy with a boring bar between centres. (See my sketch.)

As I have not seen this method described I thought that I might mention it at this time. It certainly saves many headaches in getting the holes bored right. Finally cut them off and use them as angle plates.

Rothesay,
New Brunswick. FRED MASSEY.

Hackfly—those tubes

SIR.—Although I was surprised and amused by some of the implications of Mr D. A. Wrangham's letter, I made no attempt to reply, as I expected Mr Wrangham to be effectively answered by the heavyweights of the model engineering world. However, the lack of response, and Mr Turner's acceptance of Mr Wrangham's statements, compels me to protest.

I hope that I am not misquoting Mr Wrangham, but to the best of my recollection he stated that if sixteen small tubes replaced a single large tube the heat flow would be quadrupled, the mass flow and the pressure drop being the same for large and small. Now this statement, as it was made, was slightly ambiguous, but I think we can be sure that Mr Wrangham did not intend to imply that if we replace a large tube by a nest of small tubes occupying the same amount of space, the mass flow and pressure drop will be unaltered. And I presume that both tube arrangements will be the same length.

For a given boiler, the maximum gas flow and minimum pressure drop will be given by a single large tube shaped to occupy the entire tube space. Any subdivision into smaller tubes will increase the heating area, but will also increase the pressure drop and reduce the flow of gases.

In Mr Turpin's boiler, which to me appears to be pretty tightly packed with tubes, any attempt to fit a larger number of smaller tubes will inevitably increase the resistance to the gas flow and make any comparison, on Mr Wrangham's terms, meaningless.

As far as I can see, the only way to increase the gas flow of the small-tubed boiler to equal that of the original one, would be to use far more tubes than could be packed into the original boiler shell; therefore the boiler diameter would have to be increased—probably to grotesque proportions. Perhaps Mr Wrangham would care to do the calculations and let us know the minimum boiler diameter into which could be packed sufficient tubes of, say, $\frac{1}{8}$ in. diameter, to give the same gas flow as in Mr Turpin's original design? (We will let him forget the disproportionate effect of a small amount of soot deposit.) I fancy that *Hackfly* would need renaming to suit her new appearance—*Gasometer* perhaps?

Of course, the resistance could be reduced by shortening the tubes and providing a very long combustion chamber, but this is another story, and not, I think, the one on which Mr Wrangham was lecturing.

South Harrow,
Middlesex. M. C. JONES.

Will Hackfly work?

SIR,—For some time I have intended to write, but the pressure of building four 2 h.p. steeple compound marine steam plants as a spare time effort has been too much, I have decided that I must ease up on helping others to get steam launches going as I do not have any time to run my own or do model engineering—and I have so many things that I would like to make.

The picture of a double Stuart beam engine sent in by Harry Webster (May 1) interested me as I was the instigator of this idea. I must pay tribute to the neat pipe-work this cattle rustler can do.

I have enjoyed the Civil War serial—but what a destruc-

tion ! I also enjoyed the *Boxhill* serial as much as I have deplored the one on *Hackfly*. Why is it that so many have the idea that an engine for passenger hauling is best when it is ugly, out of scale and would never find a precedent or be successful in full-size ? *Hackfly* is designed to supersede what to my mind is a beautiful Atlantic (*Firefly*).

If a fellow cannot maintain a Walschaert-geared Atlantic or fire and drive an engine with a relatively open Bristol cab, he had better go and play golf and forget trying to be an engine-driver. I do not know whether *Hackfly* has been built and proved, but there are many things about her which I find hard to believe are for the best or will even work.

In stack arrangements for instance, we are asking the exhaust steam to dive through a hole very little larger than the hole it left and to tuck in with it many times its own volume of burnt gases.

There is no dome, for the steam is fed to the regulator and safety valves through three $\frac{7}{32}$ in. holes. Any water reaching this point could return against the rush of steam. The friction of the $\frac{3}{8}$ in. dia. gland on the regulator stem, with several turns to shut it if it is wide open, is no help on slippery rails. You just cannot better the American poppet valve throttle for handling and in model sizes it can be single beat.

The excuses for some design points are lame. The sloping backhead is to give more grate area and help the fire door swing shut, but the larger area can be more easily had with a vertical backhead and the other advantage by our fitting the door frame on a slant.

If the eccentric rods cannot be connected direct to the valve stems, and rocker arms are introduced, there is no point in putting the valves outside the cylinders when they would be just as accessible on top.

The delicate $\frac{1}{4}$ in. wide guide-bars are the last straw in a design supposed to be for hard work only. This engine can only be described as a steam-driven device to move cars on rails, and it is as ugly as sin.

Having said my little piece, I will await an account of *Hackfly's* trials. The proof of the pudding is in the eating, but the pudding does not look appetising.

Victoria, CLIFF BLACKSTAFFE.
British Columbia.

Again Victoria

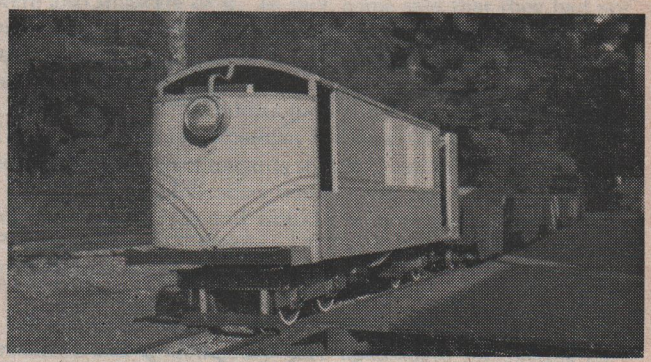
SIR,—In my letter on May 1, I mentioned the battery electric locomotive I built during the winter in my home workshop, using no plans or sketches, but by rule of thumb only—a method which many people will abhor. It is a grand success, with plenty of power and speed. I do not know yet how many days it will run on a complete charge, but feel sure of several.

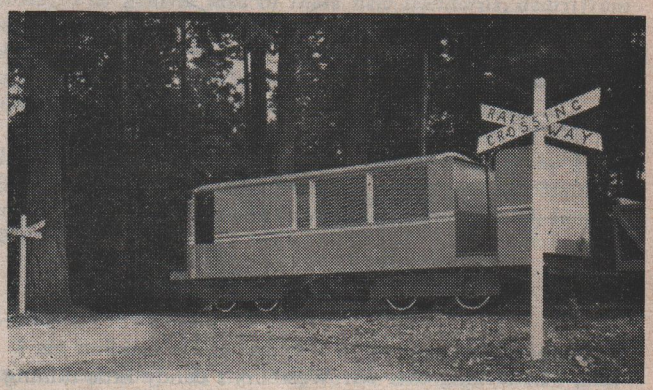
The pictures show the electric engine, and *Scot* steam locomotive.

I built the passenger cars, including the ball bearing bogies, without drawings; I made the patterns for the complete bogies, and had them cast in iron locally.

The front of the electric locomotive will be improved in appearance by windshields, doors, and so on at a later date. I have one more passenger car to build perhaps a box car with one low side. Some of my passengers have trouble lifting their legs over the side of the hopper coal cars, which are fine for young children, but not so good when they are in their eighties—and I get quite a few of them.

The small children perhaps prefer the diesel, but the older ones, of my age, prefer the $10\frac{1}{4}$ in. gauge steam locomotive. The electric is cleaner. It throws no cinders in your eyes





Top: The $10\frac{1}{4}$ in. steam locomotive. Centre and below: The Deltic is a favourite with the younger children

and has no delectable smell of coal smoke and steam, but it is fun to drive. There are two handles, one to go and one to stop.

Victoria, S. T. SIMLER.
British Columbia.

Brabazon of Tara

SIR,—As a director of Kodak (my old employers), Lord Brabazon attended the Kodak model engineering exhibitions and opened at least two of them. He had the widest range of interests of any man I have known.

Vulcan refers to his taking a bobsleigh down the famous Cresta run, but the Cresta is a one-man sleigh run, and much more hazardous than a bobsleigh.

Rustington, K. N. HARRIS.
Sussex.

[*Lord Brabazon was reported to have taken a bobsleigh down the Cresta run on his seventieth birthday*—EDITOR.]

CLUB NEWS

Send news and notices to The CLUBMAN, 19-20 Noel Street, London W1

Model yachting

There was an excellent entry of fourteen A class boats at the Rick Pond, Hampton Court, London, for the Metropolitan and Southern District Championship. The wind was mainly SW, giving a true beat and run. It was strong in the gusts, although only one yacht reduced sail. The joint winners proved to be *Serica* and *Philippa.*

In the M class National Championships held at Poole thirty yachts were entered, and 28 came to the line. There was a strong WSW wind, gusting to force 7. The winner was *Brandy Snap,* Mr. R. Stollery of the Hove and Brighton Club, with 39 points. Second was *Kay,* Mr F. Purdy of Southgate, and third *Araba,* Mr D. W. Read of Hove and Brighton.

The winning yacht was the only unorthodox design in the fleet. She is a very fine-lined boat of only 18 lb. displacement, and with pronounced V-section amidships. During the race, she was sailed with a low aspect rig which seemed to suit the conditions admirably.

In the little Portugal Cup, sailed at Fleetwood, a fleet of 16 A class yachts competed. Quite a strong WNW wind came in from the sea, backing suddenly from time to time.

Aragorn, sailed by Mr G. Oliver of Birkenhead proved the winner, with 57 points, from *My Ninepence,* Mr F. Amlot of Birkenhead. Mr K. Jones, with *Merseybeat,* another Birkenhead boat, was third, and *Rapture,* Mr N. Fish of Fleetwood, was fourth.

Mr J. Hobman of East Hull, who is a keen designer, builder and sailer of catamarans, would like to see a catamaran class recognised for racing purposes.

At Old Moat

It may interest readers in the Manchester area that a model engineering group is to be run at the Old Moat Evening Centre, Doncaster Avenue, Withington. Meetings are at 7 p.m. on Tuesdays and Thursdays, beginning on September 21. Models under construction so far include a 3 in. scale traction engine and a 3½ in. gauge *Tich* locomotive.

Norwich Midge

I hear from Mr A. W. Hoskins, secretary of the Norwich and District society, that Mr S. H. Robinson brought his 7¼ in. gauge *Midge* along to the July 8 meeting. Although Mr Robinson has built several models before, this is his first attempt at a locomotive—quite a big project to undertake at retiring age. Bonds' castings are being used, and all the machining is being done on a Myford 3½ in. lathe, the work being just within its capacity. Mr Robinson told members that the boiler was finished, thanks to help from his wife with the riveting.

Spreading the Gospel

Bert Kirby, a well-known steam enthusiast in the Melbourne district, suggests that the Surrey Hills Steam Locomotive Society should set up a portable workshop with various machines, and that it should be taken around to meetings so that the building of engines can be demonstrated to unbelievers. I assume that he intends to put the workshop under cover, as I understand that it rains even in Australia !

Ship models show

Those who love ships should make a date to visit Charlton House, South-east London, sometime between September 19-26. For that is the week that the Thames Shiplovers and Ship Model Society will be staging its third exhibition. Having seen the previous two, I can thoroughly recommend this event. It is an excellent display. The show is open from 3-9 p.m. (except Sundays), admission being by programme, price 6d.

REGATTAS

September 20 Bournville MY and PBC. RNLI events, 10r, Valley Pool, Bournville.
September 20 Wulfruna MBC. R/C steering. West Park Pool, Wolverhampton, 11 a.m.
September 20 Cheltenham SME. R/C and S/R, Arle Court, Cheltenham, 11 a.m.
September 20 Fleetwood MY & PBC, R/C meeting, Fleetwood.
September 20 Kingsmere MPBC. S/R and R/C, Rushmere Pond, Wimbledon Common, 11 a.m.
September 20 Brighton & Hove. R/C meeting.
September 26 Bournville MY and PBC. Radio control events, Valley Pool, Bournville.
September 27 Burnley MBC. R/C meeting, Shempsens Park, Burnley, Lancs.
September 27 West London MPBC. S/R Regatta, Victoria Park, 11 a.m.
September 27 Bournville MY and PBC. Bournville Cup event, 6m, Valley Pool, Bournville.
October 4 Bournville MY and PBC. Nottingham v. Bournville, M class events, Nottingham.
October 4 Thames Shiplovers and SM Society. Sailing meeting, Southchurch Park, Southend.
October 11 Bournville MY and PBC. Midland District events, A class, Witton.
October 11 Portsmouth & District MPBC. R/C Steering and special events, Canoe Lake, Portsmouth, 11 a.m.
October 18 Brighton & Hove. R/C meeting.
October 18 Bournville MY and PBC. Junior Race—Dury Anchor Trophy, M class, Valley Pool, Bournville.
October 18 Thames Shiplovers and SM Society. Sailing meeting, Round Pond, Kensington Gardens, W.
October 25 Bournville MY and PBC. Harry Hackett Cup, 6m class, Valley Pool, Bournville.
October 25 Fleetwood MY & PBC, R/C meeting, Fleetwood.

TRACTION ENGINE RALLY ROUND

September 19-20 Leeds and District Traction Engine Club. Traction Engine and Vintage Vehicles Rally at Harewood House, nr. Leeds (A.61 road). Gates, open 12 noon, Rally, 2 p.m.
October 10 Enfield & District Veteran Vehicle Society. Rally at "White Hart," Ponders End, High St., Enfield, 2 p.m.

CLUB DIARY

Dates must be sent at least four weeks before the event

September 15 City of Leeds SMEE. Traction Engine night, 7.30 p.m., Salem Chapel.
September 15-19 North London SME. Exhibition, St Andrew's Hall, Southgate, London N14.
September 16 Bristol SMEE. "Dock Engineering," by Mr W. J. Sivewright, Unitarian Hall, Lewins Mead, 7.30 p.m.
September 19-26 Metropolitan Ship Model Societies. Exhibition of Ship Models and Marine Paintings, Charlton House, Charlton Road, SE7.
September 19 Birmingham SME. Private opening of new track, Illshaw Heath.
September 19 Wigan MES. Meeting, Co-op Guild Room, Thompson Street, Whelley, 7 p.m.
September 19 SMEE. Visit to Neasden Depot, L.T. Meet Neasden (Bakerloo) 9.45 a.m.
September 19 Guildford MES. Open day and exhibition, 2 p.m. Stoke Park (northern end of Guildford by-pass).
September 20 Birmingham SME. West Midlands Federation Rally, Illshaw Heath.
September 20 Guildford MES. Open day and exhibition. (Details awaited.)
September 23 Southampton and Dist. SME. General meeting, Banister School.
September 23 Harrow and Wembley SME. Loco and general bits and pieces meeting. Heathfield School, College Road, Harrow, 7.45 p.m.
September 25 Coventry MES. A visit to an enthusiast's garden railway. Time to be arranged.
September 26 Brighton and Hove SMLE. Track day, Hove Park.
September 26 Derby SMEE. Track day, Darley Abbey, 2.30 p.m.
September 27 Brighouse and Halifax SMEE. Club visiting day.
September 28 Birmingham SME. Visit to Sutton Coldfield SME.
October 1 Eltham & District Locomotive Society. Talk. Mr W. Carter, Beehive Hotel, 8 p.m.
October 4 City of Leeds SMEE. Public passenger-carrying day at Temple Newsam, 2 p.m.
October 9 Coventry MES. Model night, 7.45 p.m., Art Room, Priory Street School, Coventry.
October 10 SMEE. "The Crampton Locomotive." Messrs J. Davies and D. H. Harris.
October 17 SMEE. Visit to Kempton Pumping Station.
October 19 Wigan MES. Meeting at 7.30 p.m. Co-op Guild Room, Thompson Street, Whelley, Wigan.
October 21 Derby SMEE. Talk on 5 in. Midland Compound, A. J. Cope, C. & W. Welfare, 7.45 p.m.
October 22-24 Ilford & West Essex MRC. Annual exhibition, Town Hall, Ilford. Thursday and Friday, 3 p.m.-9 p.m.; Saturday, 10 a.m.-9 p.m.
October 23 Coventry MES. Members' film show, Art Room, Priory School, Coventry.
October 24 Brighton and Hove SMLE. Track day, Hove Park.
October 24 Derby SMEE. Last track day of season. Darley Abbey, 2.30 p.m.
October 25 City of Leeds SMEE. Public passenger-carrying day, Temple Newsam.
October 28-31 Norwich and District SME. Exhibition, T.A. Centre, 325, Aylsham Road, Norwich.
October 30 SMEE. Annual Dinner, Piccadilly Hotel.
October 31 SMEE. Informal talk by members.
November 6 Coventry MES. Tape recording evening by Mr I. Bradley, Art Room, Priory Street School, Coventry.
November 7 SMEE. The Wanless Grinder. Report and demonstration.
November 7 Birmingham SME. Friends' Night at Illshaw Heath.
November 14 SMEE. "Making things round and straight by honing." Talk by C. L. Bennett, Esq.
November 18 Derby SMEE. Members' Slides and Films, C. & W. Welfare, 7.45 p.m.
November 20 Coventry MES. Rummage Sale, 7.45 p.m., Art Room, Priory Street School, Coventry.
November 28 SMEE. Competition Day and Working Model Display.
December 4 Coventry MES. A.G.M., 7.30 p.m. prompt, Art Roon, Priory Street School, Coventry.
December 5 Brighouse and Halifax SMEE. Winter Club Day.
December 16 Derby SMEE. Lobby Chat, C. & W. Welfare, 7.45 p.m.
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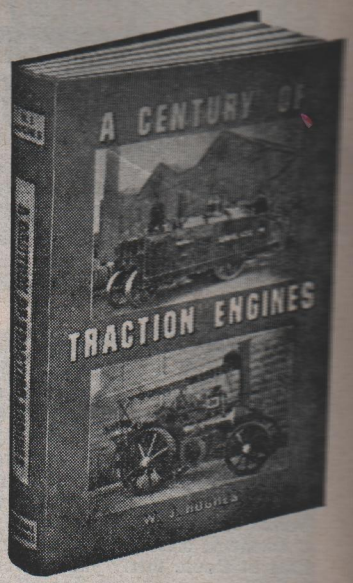

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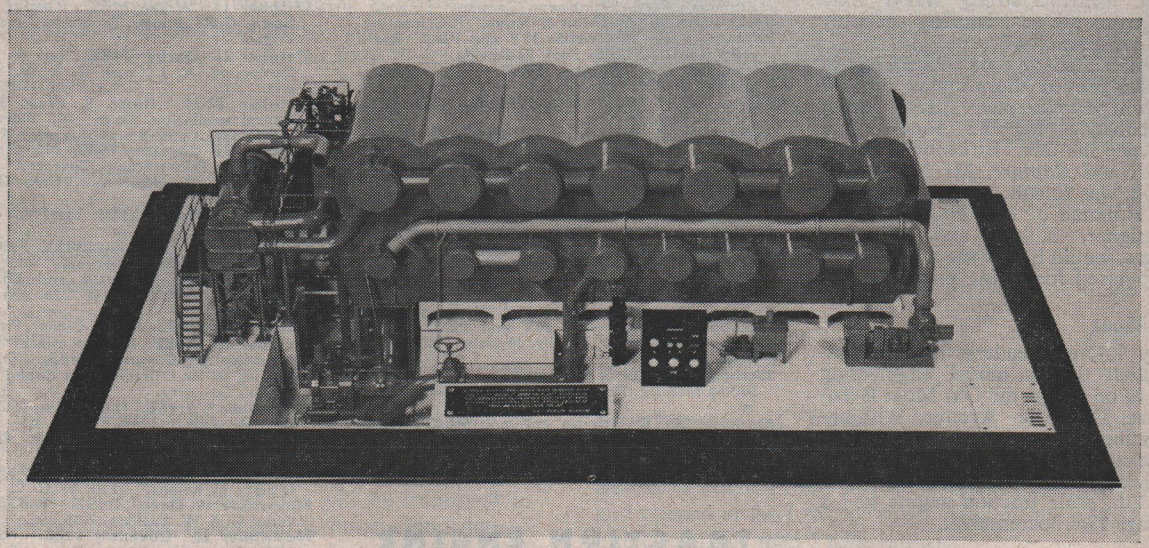

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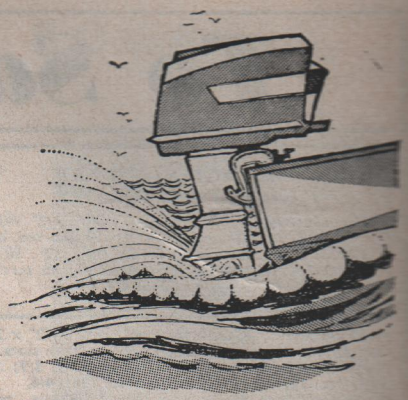

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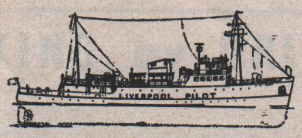

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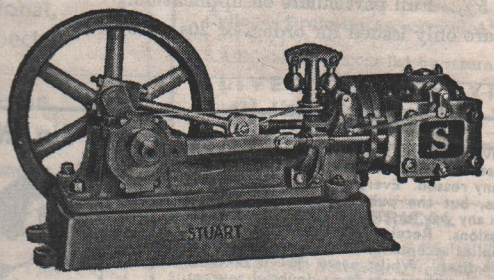

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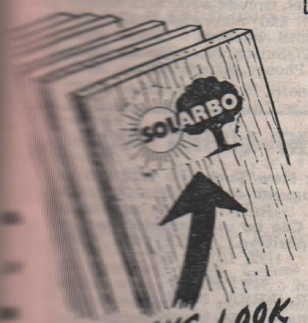

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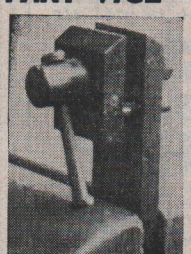

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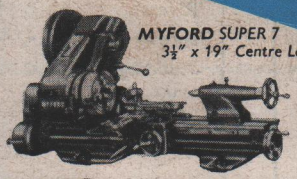

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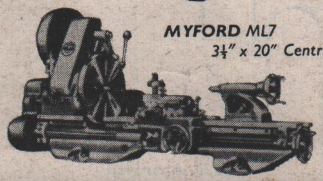

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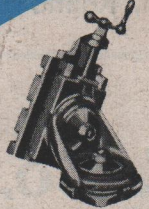

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